BIOBASE Discrete Automatic Biochemical Analyzer

Operation Manual

Please read this operation manual before using the analyzer.
Keep the manual for accessing information.

Executive Standard of the Product: YZB/Lu 0146－2011
Registration Number: Lu Food and Drug Administration. Word 2011 No. 2400179

BIOBASE

Jinan Biobase Biotech Co., Ltd.

1. Warning label description

Warning: biohazard

Warning: be careful of electric shock

Note: be careful of the danger ,it could cause personal injury or equipment damage

Warning: Be careful of burns

2 Overview

Automatic Biochemical Analyzer BIOBASE-Sapphire is the hospital's routine in vitro diagnostic equipment, and it is an instrument.used in testing a variety of biochemical index in the body fluids of patients.

It is necessary to read this chapter carefully before using BIOBASE-Sapphire,. This chapter includes important information about using the BIOBASE-Sapphire and some imprtant information of this user manual. Please use the device in accordance with the provisions of this manual so as to avoid potential personal injury or equipment damage.

2. 1 About This Manual

This manual can help the user use BIOBASE-Sapphire in a safe and correct way.For this purpose, the manual will introduce the BIOBASE-Sapphire components and working principle. This manual introduces in a detailed way the necessary software and hardware knowledge for operating the BIOBASE-Sapphire.

After having some knowledge of the components of BIOBASE-Sapphire, we will teach you step by step how to use these modules to complete routine tasks. After reading this munual thoroughly, I believe you can operate BIOBASE-Sapphire well.

We will use some warnings, hints and very useful comments emphasizing the key chapters, which have a striking "Note" mark.

This manual applies to BIOBASE-Sapphire.

2.2Introduction

The Biosafety automatic biochemical analyzer is optional automatic biochemical analyzers Jinan Xin Biobase Biotech Co., Ltd.. These types of analyzers use 120 discrete cuvettes with a moderate analysis speed, no cross-contamination, and few consumables, their reagents are opening and other advantages. Thank you for choosing our products. We will always provide services for you. If you have any requirments, please notify us. We will do our utmost for you.

Automatic biochemical analyzer is a conventional hospital diagnostic equipment, and it is an instrument.used in testing a variety of biochemical index in the body fluids of patients.Since 1960s when the first biochemical analyzer was made , it has been developing by leaps and bounds. Whether from the instrument's accuracy, or manufacture of precision as well as its functions,, the analyzers we produce approach or reach the level of their foreign counterparts.BIOBASE series of discrete automatic biochemical analyzers use discrete cuvettes which are segregated and have no cross-contamination between each other significantly improving the precision and speed of the instrument,. Overcoming the defects such as the relatively low analysis speed of flow cuvette, serious cross-contamination and low accuracy, so these series of analyzers arewelcomed by the majority of hospitals.

2.3 **Users**

BIOBASE-Sapphire is operated by professional eople in accordance with the munual.

2.4 **Security**

The following sections will introduce the note in terms of security, electronics and other relevant potential dangers.

2.5 **General Prevention**

When operating BIOBASE-Sapphire, the user should be strictly in compliance with laboratory practice, and must wear suitable protective clothing and rubber gloves.

During the operation of BIOBASE-Sapphire, the sample arm move quickly, so the user should not place the hand in the work area of the moving parts so as to avoid accidental injury. Meanwhile , the user should not rely on BIOBASE-Sapphire or tilt it to avoid potential personal injury or equipment damage.

2.6 Electrical Safety Precautions

When disassembling the equipment components or circuit boards, the user should first turn off the power of the BIOBASE-Sapphire and disconnect the powe

2.7 Computer Preventive Measures

Some measures should be taken to guard against computer viruses, and the computer can not be used for other purposes.The computer should only use the user software written for BIOBASE-Sapphire by Jinan Biobase Biotech Co., Ltd.

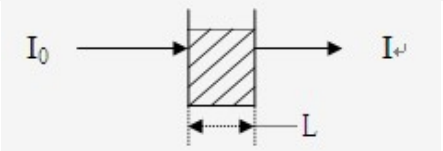
2.8 Processing Machines

Please dispose of the analyzer in accordance with local waste disposal standards.

3. Introduction

3.1 Basic Principles

According to the Lambert - Beer law, when a bunch of incident light shoots through the colorimetric solution, there is the law concerning the incident light, transmitted light and the solution of light absorption.



$$A=-\mathrm{Log}_{10}T=KCL$$

$$T=I/I_0$$

I_0---- Incident light intensity
I----- Transmitted light intensity
A---- Absorbance
C----- Concentration
L----- Optical path
k----- Coefficient

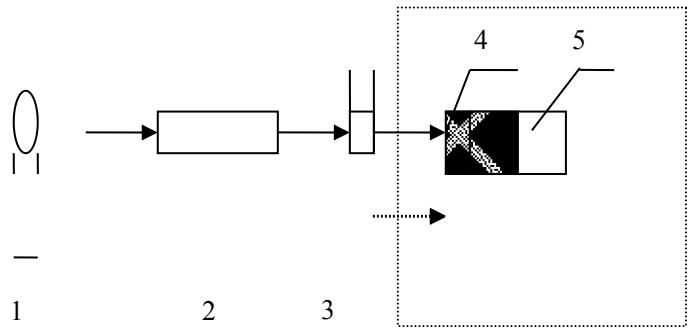
The testing principle of biochemical analyzer mainly applies light absorption: the Lambert - Beer law, by measuring the absorbance of the monochromatic light which shoots through the liquid mixture of the serum or urine and other body fluids and reagents to determine whether human physiological indicators are normal.

3.2 Hardware

In order to auto-complete specimen test, hardware support is indispensable,

which includes the following aspects:

3.2.1 Optical System



1. light source 2. fiber guided beam 3. Cuvette 4. interference filter 5. Optoelectronic receivers
Figure 1 the optical path diagram

Instrument optical system shown in Figure 1

Light of light source shoots upon the fiber end and then is divided into eight beams which act as the incident light shooting upon the cuvette. The beams become monochromatic light after shooting through the solution and go into interference filter spectrophotometric and then shoots a photoelectric receiver.

We choose the quartz glass halogen lamp of 12V 20W as thr light source, ant the light source collimates into a parallel beam of 2.5mm diameter. We should use rectangular discrete plexiglass cuvette of 6mm optical diameter through which UV can shoot through cuvettes. Cuvettes should be uniform in the shape and there should be no scratches on the surface of light transmission hole. Light transmittance slot of precise 120 attainment yards disk align at the middle of the cuvette so as to ensure the readings sampling point is in the middle of the cuvette; 120 cuvettes are placed in a circle of the reaction plate with the smallest volume of 180ul. The advantage is that there is no cross contamination. Taking into account the speed of rotating colorimetric turntable, we use static eight-way splitter system, and integrated components package consisting of import filters and optical receiver to test wavelength of 340,405,450,510,546,578,630,700 with spectral half width of less than 10nm ± 2nm, so that we can collect eight wavelength data at once without any mechanical movement, and overcome the defect that the reaction disk of some of the imported products and the filter halo also rotate at the same time so as to ensure measurement accuracy.

3. 2. 2 **Circuit**

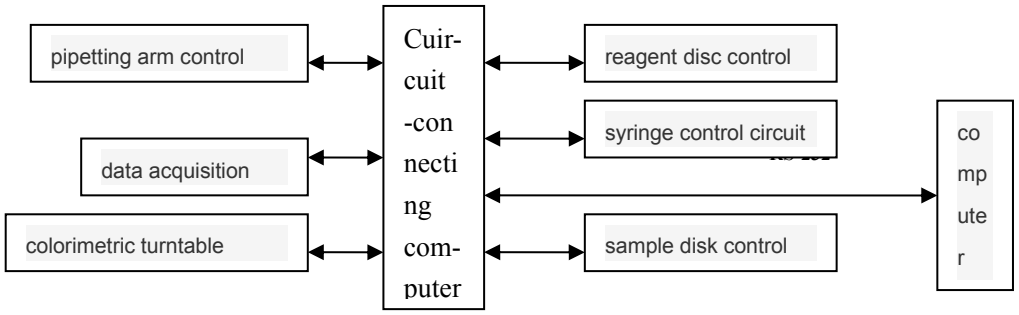


Figure 2 The circuit diagram

The whole circuit diagram is shown in Figure 2

We adopt a 8051 single chip microcomputer to control the direction, speed, rotation steps and other functions of a stepper moto and then associated with the computer through the serial bus connection and then the RS-232 interface. The rotation and lift of pipetting arm / reagent arm / mixing arm are mainly controled by two stepper motors and eight position sensors detect the movements and rotational position of sample arm / the reagents arm / stirring arm; liquid level sensor detects the sample and reagent liquid level; data acquisition circuit uses eight separate pre-amplifier circuit, respectively, to enlarge the electrical signals of the photoelectric sensor, the A / D converter converts analog signals into digital signals; Colorimetric turntable control circuit---stepper motor controls drive, cuvette

position sensor, the heating power and temperature control circuit, and regulator power supply of 12V 20W light, etc.; reagent disk control circuit---stepper motor controls drive, reagent position sensor and provides two cooler power that ensures reagent refrigeration and temperature control circuit, etc.; syringe control circuit is driven by two stepper motors which respectively drive the sample syringe and reagent syringes,, two position sensors sense the original location of the syringe, and a solenoid valve controls cleaning and conversion of the sample; sample disk control circuit consists of a stepper motor and a position sensor. The position sensor is a photoelectric sensor.

The interface circuit consists of two 8051 single chip microcomputers and some peripheral circuits and is used to the convert the command sent by the computer into executable command for various moving parts so as to coordinate the work of the various components; meanwhile it sends the A / D conversed digital signal and instrument status information to the computer

3. 3 **Software**

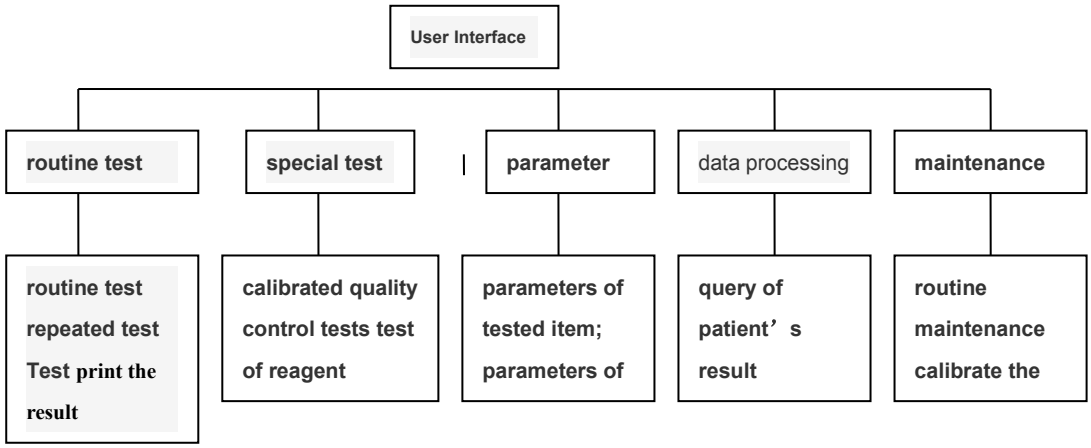


Figure 3. Software structure diagram

The software consists of two parts, namely computer operating software and single-chip control software; the framework of computer operating software is shown in Figure 3.

The user interface is formed by Visual Basic development tools in Windows2000 platform and its database is in Access forms. Under the unified user interface , specific function is accomplished by each sub-module.

Routine testing menu is mainly to complete the daily work and it consists of several sub- menus: the conventional test is carried out in entry of the day-to-day specimens information of the patients, in the choice of test items, and in testing samples, and it is the most commonly used software module of the instrument; emergency test is carried out in emergency specimens entry and in emergency insertion test of emergency specimens, priority having been given to some choreographed specimens; real-time results show that real-time display of test results for each specimen; response curve display module can display the reaction curve of a sample in any testitem and at any time so as to easily understand the details of the test; instrument status submenu can show real-time display of each work status of the instrument; Printing the result means to verify the detected samples results , print test results reports and give it back to patients. Thus a complete cycle is completed

The parameter setting menu is to complete the module produced by various parameters and it consists of two sub-menus: the sub-menu of parameters of tested item mainly sets the sample volume, reagent volume, the analysis wavelength, test methods and other parameters of each tested items:; parameter settings of special items is to set a formula, based on which test results has been calculated and form a new item results; combinated items

settings is to facilitate the item input Based on clinical requirements, routine testing items can be combined into a new item , and we can enter the new combinated item name while inputting these items.

Special inspection is the exclusive test in addition to routine test, and it can test the standard samples, draw standard curves, test quality control specimen, describe quality control diagram and other work; it can also test the instrument performance, such as linear measurement,absorbance measurements, the repeatability measurements ,which has facilitated the identification of the measurement work and special needs of the users; The layout of each test reagents used in the test means the position of reagents on turntable is set so that the instrument can accurately find the required reagents. Instruments can measure the amount of each reagent before the item is tested and tell the operator whether he needs to add reagents. Maintenance and repair of sub-menu facilitates maintenance engineers to test various components of the instrument so as to identify failures.

Data processing module can check the patient's test results, QC results etc,, and carry out mathematical statistics, calculate daily average, and draw trend mapping to provide valuable statistical information to the Clinical Laboratory; records of equipment failure can record the fault information of the instrument while working and provide maintenance information to maintenance personnel.

Instrument maintenance and maintenance module are to provide staff with a means of detection instrument. Routine maintenance can provide routine maintenance of the instrument and calibrating the instrument can test the instrument's moving parts and optical signal.

SCM software is compiled by using assembly language and is used to manage coordination operation of each motor of the management, data acquisition and other work.

3. 4 **Structure**

Biochemical analyzer consists of the main unit of analyzer, computer (including the main unit and monitor), the Windows 2000 or more superior operating system , exclusive software and printers, etc..

It is suggested to buy the computer and printer which meet the national standard.

Minimum configuration: Computer frequency should be no less than 500MHz;
RAM should be greater than 128M;

Hard disk capacity should be greater than 40G;
Monitor should be 15 inches or more in length,and resolution shoud be no less than 1024 × 768;
The printer should be a ordinary inkjet or laser printer.
The main structure of the biochemical analyzer's main unit.
Sample parts: the reagent dial, sample dial, sample arm, the reagent arm, diluting instrument.
Detection parts: optical system, filters, signal acquisition.

3.5 The Scopes of the Products

This product is suitable for medical and biochemical analysis test.

3.6 Sample Collection

The sample must be fresh specimens collected in the same day. Serum is centrifuged samples from the sample as test specimens, and sample should not have the phenomenon of hemolysis or coagulation.

! ! !Note: The specimens may carry infectious bacteria. Dood protection is needed when handling specimens. Operator should wear a mask and put on work clothes to avoid being infected, and in some cases protective glasses is a necessity.

When handling waste, operator should wear a mask and put on work clothes to prevent infection, and in some cases protective glasses is a necessity. Please observe the local emission standards, and consult the reagent manufacturer or distributor.

3.7 Technical Data Sheet

Analysis Method: End-point method, two-point method, dynamic method, turbidimetric method.

Analyzing item: Maximum of analyzing 45 items at the same time
Programming items: program any test items.
Sample volume: 2 μL of-50ul of (0.1ul per step).
Reagent volume: R1 :25-300ul; R2 :10-150ul (1ul per step).

Reagents: the minimum reaction solution is 180ul.

Emergency samples: place the emergency samples and control materials to any location in the sample dial at any time, automatic detection is given priority.

Calibration: one-point calibration, multi-point calibration.
QC: quality control can be joined at any time. The same item can have up to six kinds of quality control.

Reaction time: about 15 minutes.

Optical system: Interference Filter (nm):
340,405,450,510,546,578,630,700.Detection of single and dual wavelength.
Light source: 12V 20W halogen lamps, optical fiber guides light.
Accept: 8 imported photoelectric receiver.

The linear range :0.000-2 .500 Abs

Temperature Control: 1, the temperature of reaction disk is 37 ± 0.1 ° C;2, the reagent is refrigerated at the temoerature which is 8 ℃ lower than that of the room.
Reaction cup: 120 micro-violet plexiglass material cuvette (standard optical path is 6mm in length).

The liquid level detection: automatic level sensing probes.

Software: English interface of Windows 2000 or more superior version.

Power supply: AC220V ± 22V, 50Hz ± 1Hz, 1.5KW.

3.8 Installation Requirements

3.8.1 Installation Environment

1、indoor installation only;
2、the ground should be flat (inclination should be less than 1/200);
3、BIOBASE-Sapphire ground is able to withstand 100kg of weight at least;
4、there should be no direct sunlight in venues;
5、there is less dust, less vibration and low noise in venues;
6、should not be close to strong electrical interference sources;
7、a good grounding, and grounding resistance is less than 4Ω

3.8.2**Temperature and Humidity**

1、 room temperature should be between 15-30 ℃;
2、 the relative humidity shoud be no higher than 80%;
3、 the room should be well-ventilated.

3.8.3 Installation Space

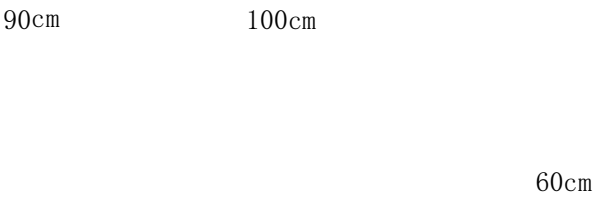


Figure 4. Installation space schematic

Main unit: BIOBASE-Sapphire: length 90mm × width 740mm × height 60mm
! ! !Note: power supply board at the rear of the side of the instrument should not be blocked off which is to facilitate the operation of the power switch.

3.8.4

Power and Grounding

1, power supply: AC 220V ± 22V, 50Hz ± 1Hz;
2.Input power: BIOBASE-Sapphire: 400W;
3, grounding resistance: <4Ω.

3.8.5

Deionized Water

Less than 5 liters per hour, conductivity is less than 2.0us/cm.

3.9 Transport and Storage Requirements

In the packaging state, analyzer should be transported according to the ordering contract. Severe impact, rain and exposure should be avoided during transport. Packaging analyzer should be stored at 0 ° C to 40 ° C with relative humidity no more than 85%, non-corrosive gases and a well-ventilated environment.

3.10 Standard Configuration

Serial number	Name	Unit (There is no corresponding units of quantity in English	Quantity	Remarks

1	**Main unit**	/	1	
2	**Manual**	/	1	
3	**Warranty card**	/	1	
4	**Certificate**	/	1	
5	**Accessories box**			
5.1	**Sample cup**	/	1	Quantity:500
5.2	**Cuvette**	/	2	
5.3	**Positioning block of reagent bottle**	/	45	
5.4	**Bucket**	/	2	
5.5	**RS232 communication cable**	/	1	
5.6	**Power cord**	/	1	
5.7	**Operating software (CD-ROM)**	/	1	CD
5.8	**External pipes**	/	1	4mm×6mm
5.9	**External pipes**	/	1	6.5mm×10mm
5.10	**Simple tools**	/	1	
5.11	**Spare halogen light**	/	1	
5.12	**Fuse**	/	2	
5.13	**Water falling head**	/	2	
5.14	**Yellow-green ground**	/	2	
5.15	**Large joints and nuts of large joints**	/	1	
5.16	**Small joints and nuts of small joints**	/	3	

4. Overview of System Operation

4. 1 Introduction of the System

4.1.1 Hardware

1、the main unit

BIOBASE-Sapphire automatic biochemical analyzer is a landing automatic biochemical analyzer which adopts stand-cuvette. The instrument is operated without human intervention during the whole processo, and the reagent dial has the function cold storage.

2、Computer and printer

All operations and control of the instrument are under computer control and it is connected to the computer interface through RS-232 serial port. The quality of the computer will directly affect the quality of the system, so the computer must be of good quality and its conventional configuration should meet the system requirements. To satisfy the need of installing the system software, the computer must have the CD-ROM. The computer is a dedicated instrument, not being allowed to do other work, in particular not being allowed to play games and install other software which is at the risk of being infected with a virus. The printer is used to print a test report, and a laser printer is given priority

! ! !Note: The computer should not used for any other purposes!

Software:

The instrument is equipped with a set of system software CD-ROM, which is developed based on the Windows 2000 platform, so the Chinese Windows2000 operating system or the superior system must be installed in the computer.

4.1.2

Installation of the Instrument

1 Unpacking the Instrument

This instrument is a valuable precision instruments. Particular attention should be given to lightly packaging and releasing and invertion of the instrument is not allowed in the process of shipping and handling the instrument; it is necessary to firstly check whether the box is complete or moistened before installing the instrument, if the above situation happens, it is necessary to notify the staff and they will handle the issue.

The unpackaging steps are as follows:

First remove the panel and side panel of the packaging of the wooden box;

Remove the four screws in the bottom of the backplane;Remove shockproof foam packaging;

As the instrument is relatively heavy, two or more staff are needed to lift the instrument. If the instrument is too wide and can not enter the door, the instrument can be tilted slightly, but can not be inverted; instrument is required to be placed in the level firmly, and 30cm with of space at the back of the instrument should be left for maintenance;
Remove the moisture-proof plastic sheeting of the instrument;
Remove the apparatus used for t fixed attachment of the instrument during the transport, see Figure as follow

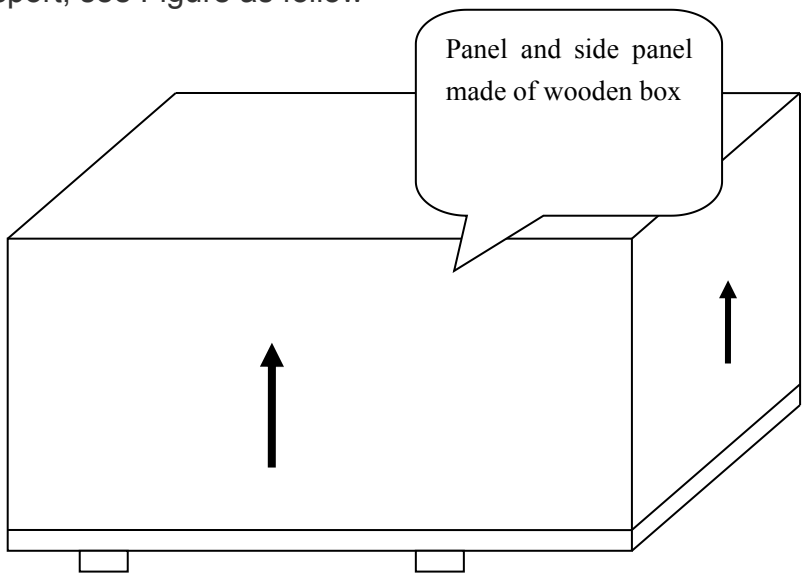


Figure 5 Schematic diagram of packaging

Inspect equipment for any abnormal signs, remove the instrument panel to check the circuit board and whether connector is loose, if it is loose , please fix it.

2, instrument installation
Install cleaning bucket;
Install the waste buckets;

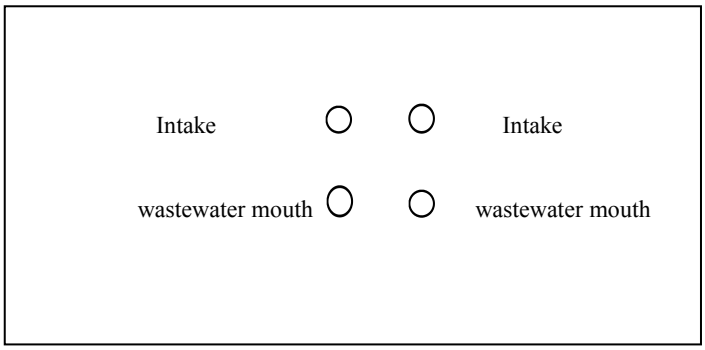


Figure 6. schematic of instrument connecting to the pipes
Rear View

Connected into the water pipes and waste pipes;Install computer and printer;

Connect the power cord and RS-232 serial cable Pour deionized water in a bucket.

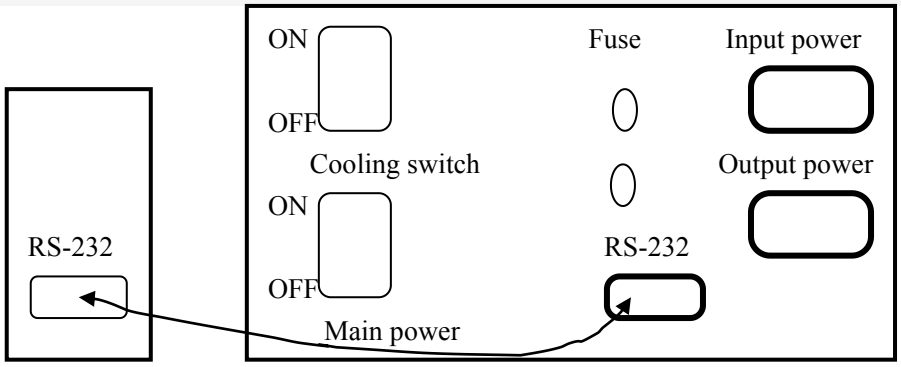


Figure 7. schematic of computer and instruments connecting with RS-232 line

! ! !Note: The parts of the outlet pipe inserting into the waste container should not be too long, 10 cm in length is appropriate, so as to prevent the excessive wastewater immersing outlet pipe which will result in poor drainage. !

4.2 Simple Operation Process

4.2.1 Preparation Before Turning on the Machine

Prepare cleaning which will use a bucket of 10 liters or more deionized water.

Prepare a variety of test reagents and add them to corresponding reagents kit;

Prepare the samples specimens which will be tested, and add them to the sample cup and put them on the sample holder;

Check whether the power voltage is normal.

4.2.2 Turning on the Machine

Turn on the power switch (which is located on the right side of the maon unit on the back panel, above which is refrigeration power switch and under which is the main power switch);

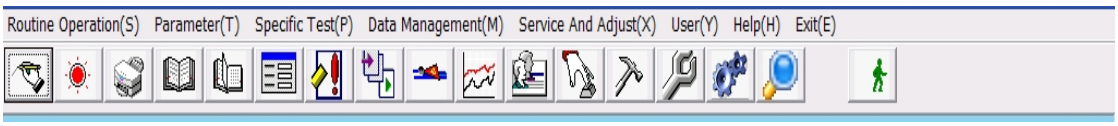
Turn on the computer power switch and the printer power switch, and the main computer Windows interface appears; double-click the shortcut "BIOBASE-Sapphire" and enter the “log in” interface; enter a user name and password (the initial user name and password are number "1000"); if they are confirmed, yon can go to the "BIOBASE-Sapphire" main test interface

Please be ready to detect the specimens after the main unit has warmed up for 30 minutes.

Please be ready to detect the specimens after the main unit has warmed up for 30 minutes.

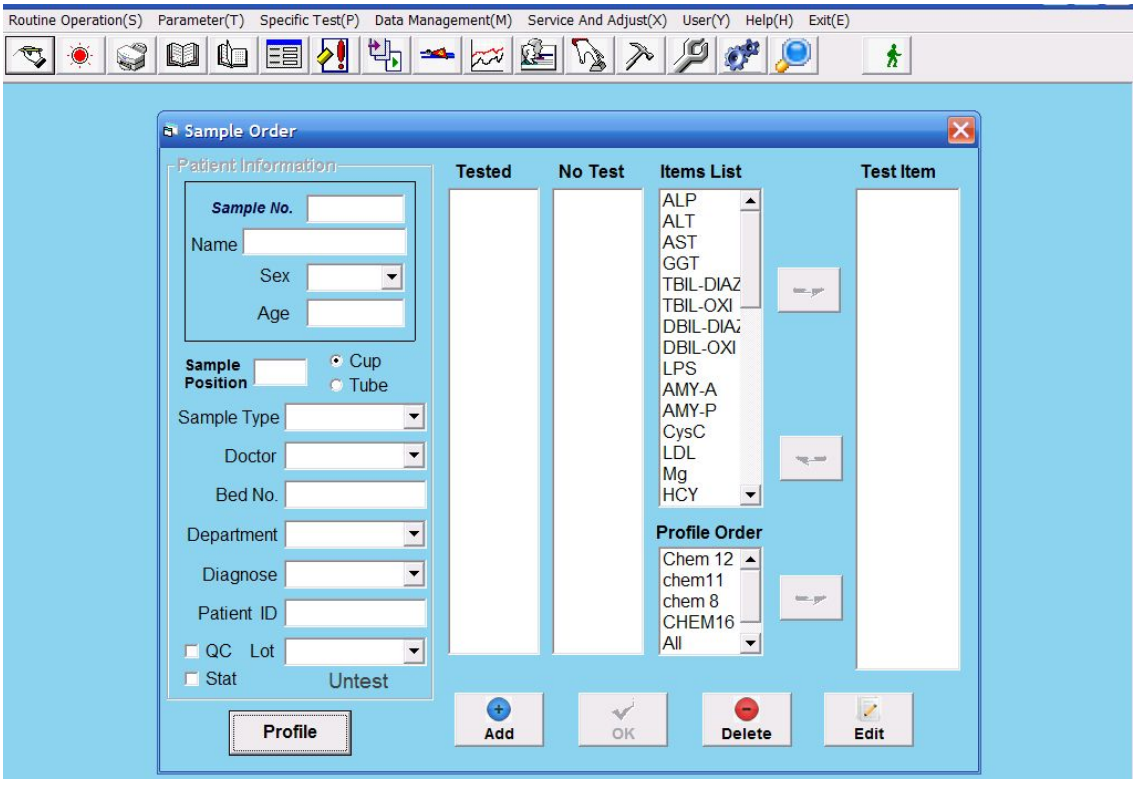
4. 2. 3 Test the Sample Specimens

The software interface is as follows:



Click on the Routine operation to enter the following interface

Click on the “sample order "into the following interface

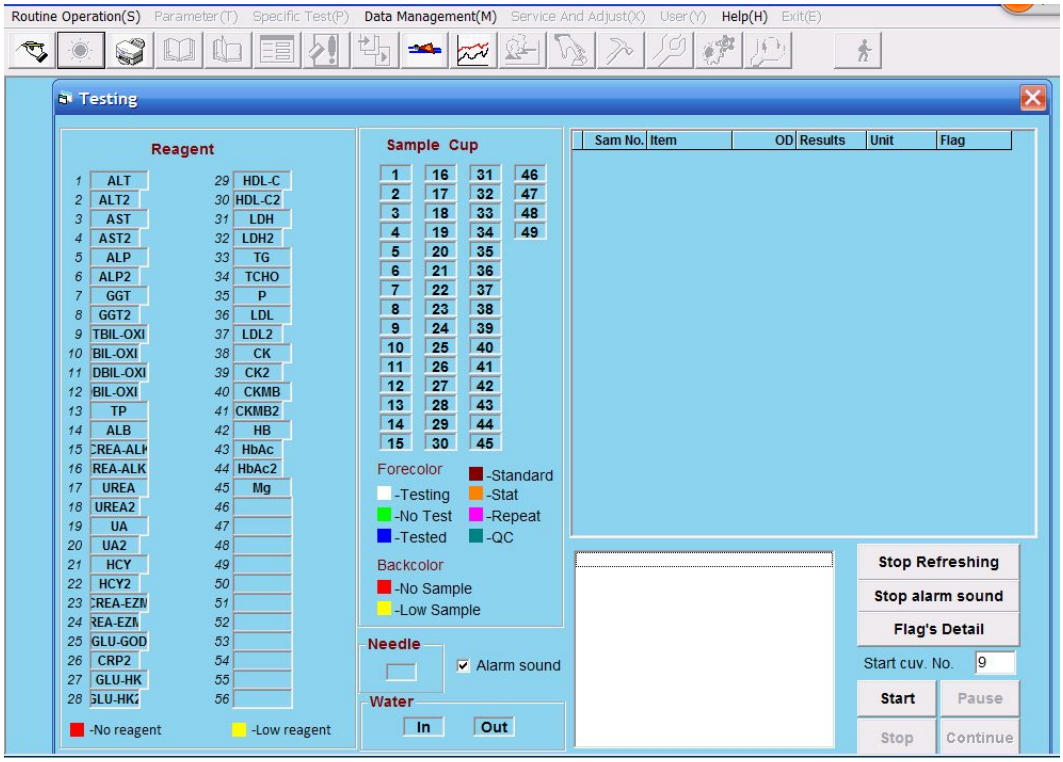


4. 2. 4 Enter the Patient Information and Test Items

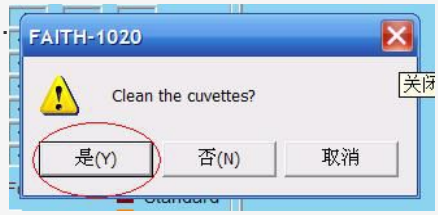
Click "add" button to enter the patient information;

Input patient information and specimen information(sample position is the position number you choose on sample disk);
Select the test item, and cllick in the name of the test items (press Ctrl to make jumping options, or press Shift to make consecutive multiple-choice) the item is displayed as selected, click "=>" (you can double-click to add) to enter them to the column of test items.You also can select other items, and enter "OK" button to confirm;

Repeat the above steps. When the entry is completed, please exit the routine test login screen.Click "Testing" or to enter the following test interface:



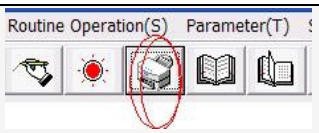
Check reagents and samples in accordance with the place order of the reagents and samples in the interface.Enter the number of the first cuvette and click the Start button. Hint bar prompts information.



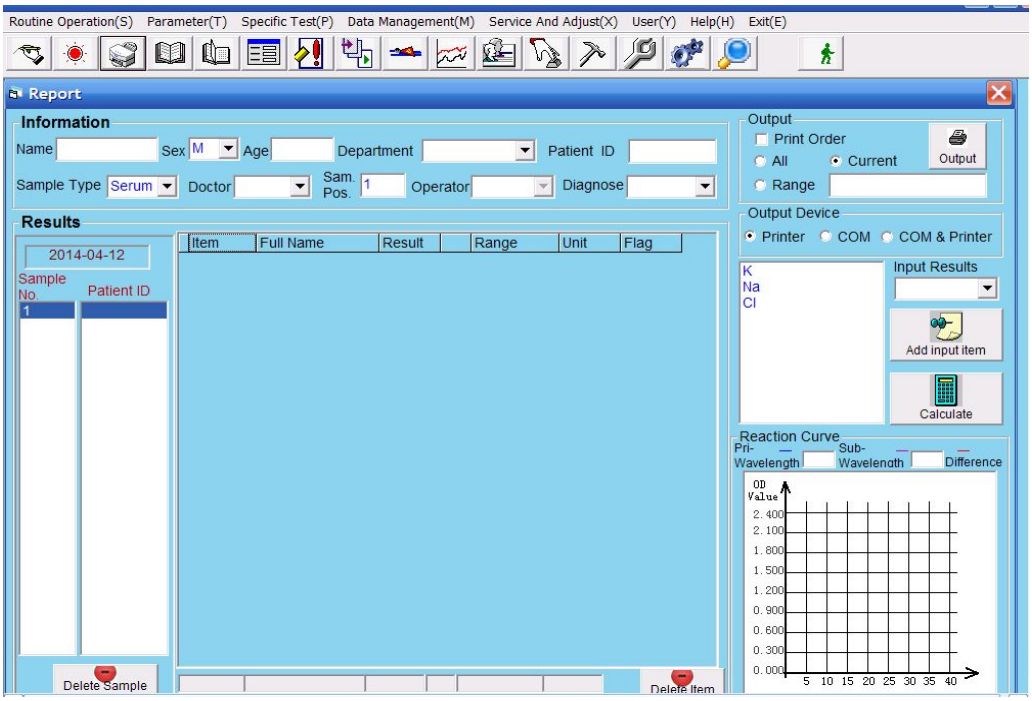
After confirmation, please click "OK" button to start the test;

Instrument starts to test the sample, and the information of the sample is revealed in the instrument column.

4. 2. 5 Processing and Printing of the Result

In the sample test menu, please click ‘Report’ or 

, the following interface appear:



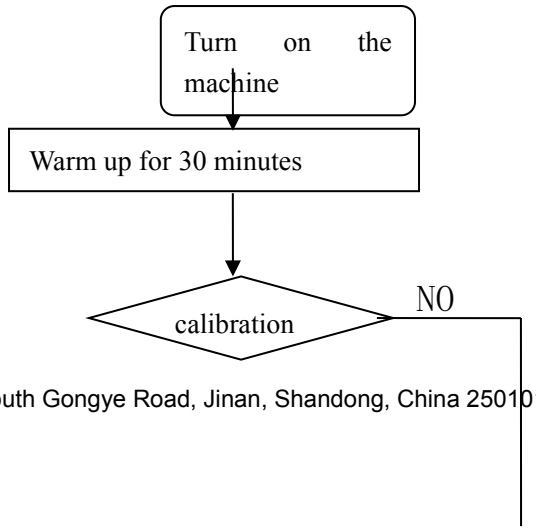
Select the number of samples in Sample ID list box,, and the results are displayed in the results column. If you need patient information, please enter patient information in patient information column. If you need to print other test results, some other relevant information can be input to the adding column. The results can also be edited in the interface;

After the test result is confirmed, please select to print the current report or the whole report,or choose to print a range of the report;

After finishing the detection, please turn off the system, exit the test interface, and turn off your computer.

5. Routine Operation

5.1 Flow Chart



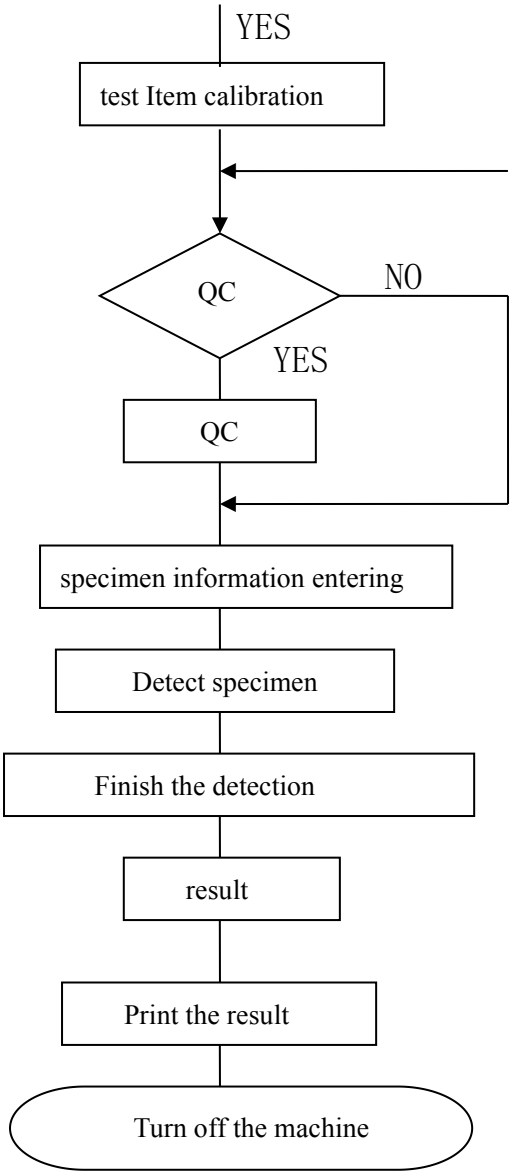


Figure 8 daily operation flow chart

5.2 Specimen Detection

5.2.1 Preparation for Detection

1、 specimen preparation

Serum samples will be available after centrifuging the tested blood. The serum should not have clot, hemolysis, and other phenomena. Pour serum or urine to the sample cup, and there should be no bubbles in the sample cup;

2、reagent preparation

Add a sufficient amount of reagent in the kit and it is required that within the validity period, quality of reagents should be stable and reliable;

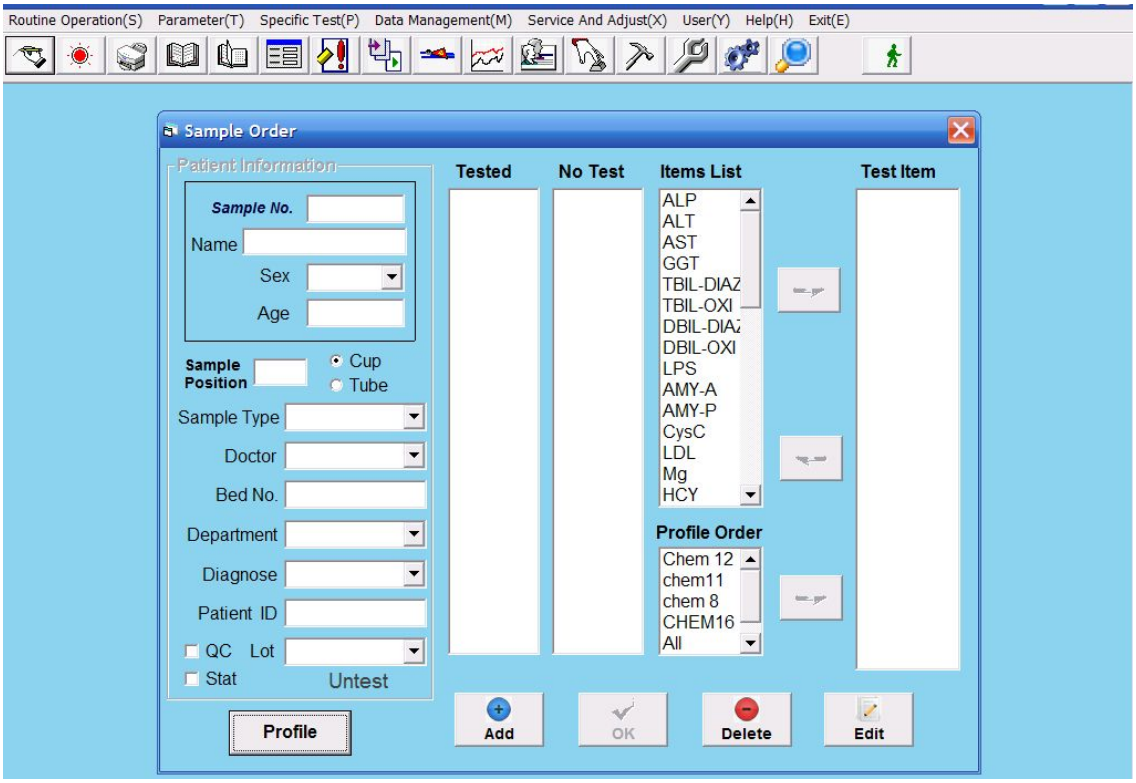
3. clean water preparation

It is preferably to use deionized water with conductivity less than 2.0us/cm;

Test procedure:

Click the “Routine operation” to enter the following test interface:

Click the "Sample order" menu to enter the following interface:



Click "add" button and Input the information: input the number of samples (sample number can only have a unique number within a day without repeative use);

The patient's name, gender, age can be entered in the patient information bar, patient information can be input while the test report is being printed;
In the Specimen Information Bar, you can edit the sample number. Sample number conform to the placement of specimens in the sample circle (the number of location can be repeatitive);

Specimen types: serum, urine and others;

Submission unit: the name of the department which sends specimens;

Patient number: If he is the out-patients, enter patient number; patients in hospital, enter the hospital number;

Combination login: If you have a number of specimens, , and each specimen will be tested in terms of the same item, in order to facilitate rapid input , you can place them continuously on the specimen ring and use the combination login: firstly enter the starting specimen number, and then enter the start cup No. Finally, enter the quantity of specimen. Then the number of sample specimens and sample number starting Cup are continuously choreograped automatically by a computer;

Item selection: You can two input methods----individual item input and item portfolio input . Portfolio items are defined in later chapters; If you select the individual item, you can cllick in the name of the test items (press Ctrl to make jumping options, or press Shift to make consecutive multiple-choice) the item is displayed as selected, click "=>" (you can double-click to add) to enter them to the column of test items.You also can select other items, and enter "OK" button to confirm;

If you select the input of the item portfolio, you can select the name of the item portfolio to be tested in the the item portfolio bar. Click on the item, the item is displayed as selected, click the "=>" and add it to Selected Item column; if you want to delete a test item , please click the test item in the Selected Item column, click the" <= " to delete the test item;

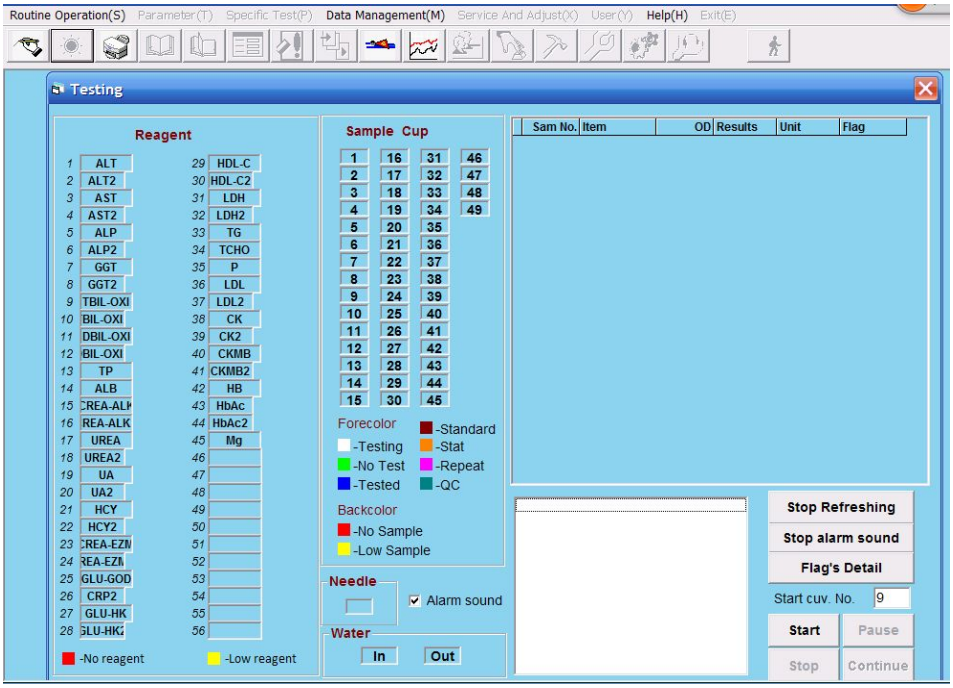
Repeat the above operation to input the specimens;You can edit the information entered. In the Lonin Column, you can select a sample number for inquiries and it will reveal the information of patient and test items.You can use "Edit" or "delete" button to edit and delete the displayed content.If the information is correct, please enter “OK” button for conformation;

Note: The patient information can be entered here and can also be input while printing a test report;

When the input is completed, please exit the Sample Input interface.

5.2.2 Test

Click on the "Testing" or to enter the following test interface:



Check reagent and sample in accordance with the placement order of the reagents and samples in the interface.Enter the number of the'Start cuvette Number , click the "Start" button and pop-up the hint box:

This interface is to remind users to check whether the reaction cup is washed clean and whether the number of selected initial and last reaction cup is correct;

After confirmation, please click "

OK", the instrument begins test; If you cancell the above input, please click the "

Cancel";

If you want to suspend operations in the testing process, please press the "pause" button (Note: pause time in the testing process can not be too long) If you want to continue the test, please press the "Continue", the instruments will continue to test.If you want to cease the operation you can click the Stop button to cancel all tests and retreat to the main interface;

After confirmation, please click "

OK". The status bar will have real-time display of the sample state in order to observe the work of the instrument;

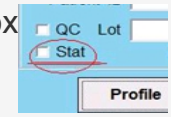
When the insrument is to show the test results show, it will have real-time display of test results, absorbance, and other information in the results colum. There will be a new test results about every 18 seconds. If a picture can not show all test results, the vertical scroll bar on the right side of the interface can be scrolled to show all the test data.

5.3 Testing the Emergency Specimens

In the process of testing specimens, emergency specimens can be inserted at any time;

Put the specimens on the sample ring (specimens can be placed on any vacancy in the sample circle. Action should be quick, do not place the specimens while the sample circle is rotating);

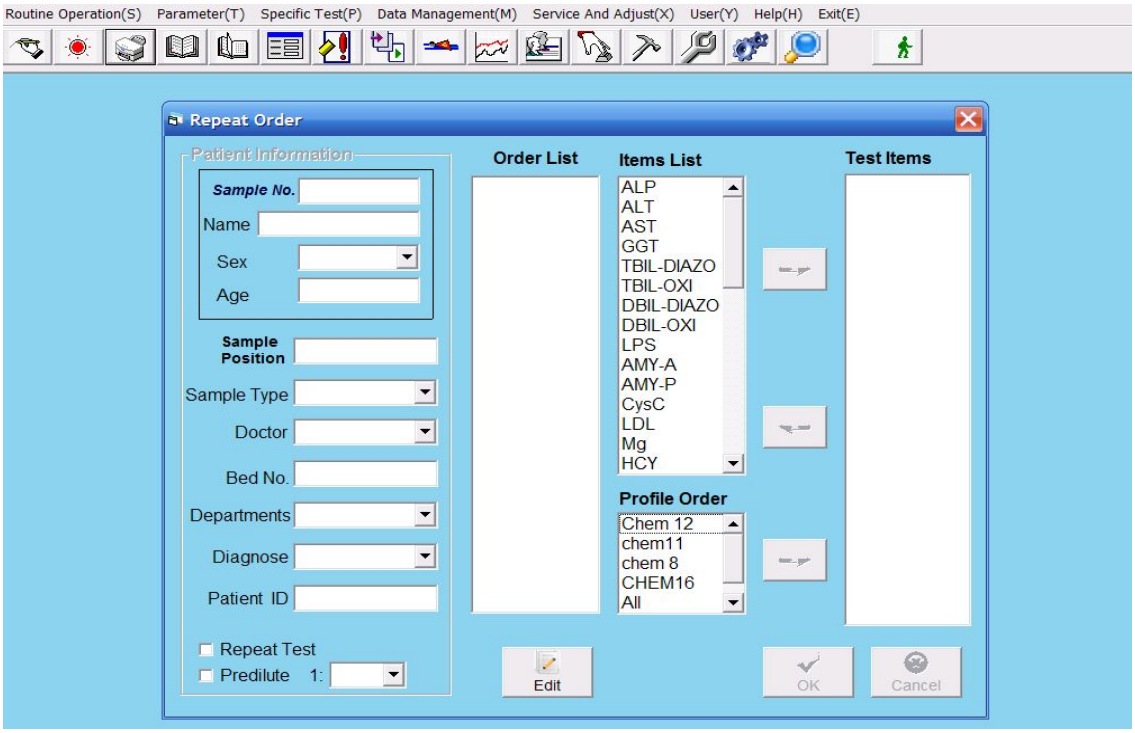
"Sample order" menu interface is as follows:

Emergency interface and routine test interface is roughly the same, and the difference is that when entering the emergency sample, one should select the emergency check box 

(see above).The other input is the same with a common sample. After the input is completed and the current sample is finished, the instrument will test emergency specimens.

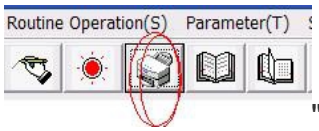
5.4 Re-testing Sample Inputting

If the item of some specimens was found too high in concentration or other bad results, you can re-test it. The test results will overwrite the original data. We can enter the “Repeat test”, and the interface is as follows:

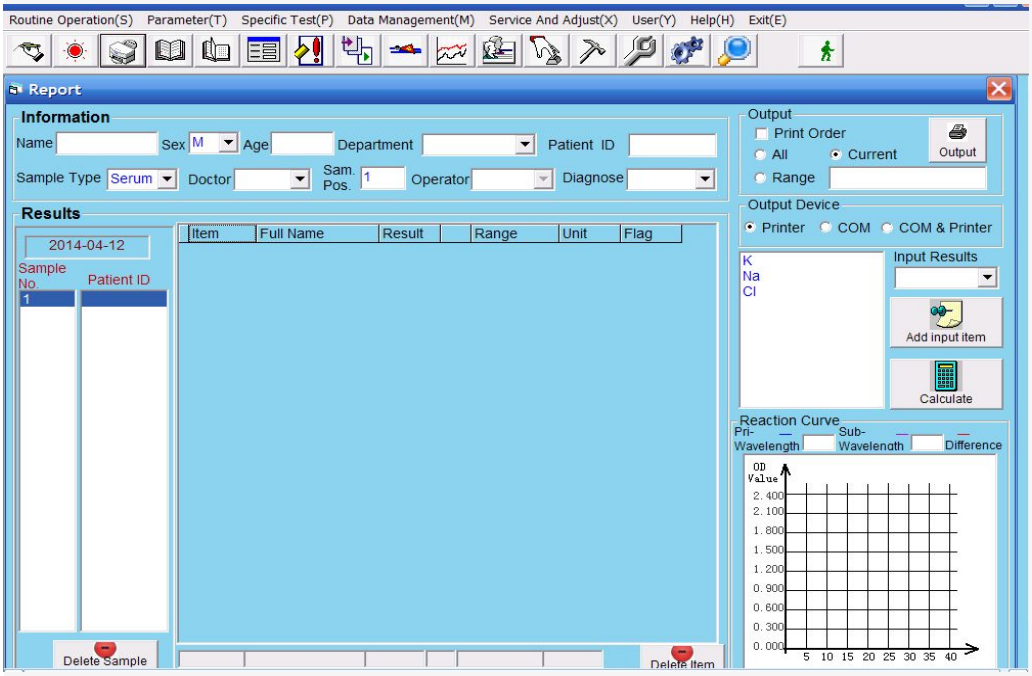


As follows:
Select the number of specimen which will be retested, edit it. Select the items which will be retested and add them to the selected item. Repeat the above process multiple input samples. Click Save to enter the test interface for test.

5.5 Registration and Print of the Results

Click ‘Report’ or 

" to enter the following interface:



The specimen test results of the day can all be found in the results sample box. First, select the number of samples, and test results are displayed in the results column; If it is needed to enter patient information, please enter the patient information in patient information column; If need to print other test results in the report, you can also add item name in addition column and enter data in the results column; If you want to edit the test results, move the cursor to results column in which the results are needed to be replaced. Enter the new results and confirm.

If all the samples have not been tested, and you want to print part of the results report (release the report while testing the sample), you have to click the button of “Calculate the item”. Once the specimen is tested, the calculation results will appear immediately; otherwise the calculation results will appear after all the tests end.
If there is the "√" mark in “Print inorder check” box, it means the printing order of the data conforms to the setting of date printing order described by the user in

data maintenance (printing order maintainance is defined in "Print Settings" of "data processing").

After confirming test result, please select “All ” “current ” or ‘range’ for printing. ‘The report format is as follows:

××××××test report

Item NO.：0764

NAME：_____ SEX___ AGE___ No ITEM RESULT 单

1	ALT	13.00	U/L	0.00—45.00	9	TG	1.46	mmol/l	0.48—1.88
2	AST	25.00	U/L	0.00—45.00	10	Crea	70.0	umol/l	36.0—144.0
3	AKP	83.00	U/L	15.0—150.0					
4	TBIL	16.80	umol/l	6.0—22.0					
5	IBIL	6.00	umol/l	0.00—6.0					
6	TP	74.50	g/L	60.0—85.0					

DATE：200*/*/*

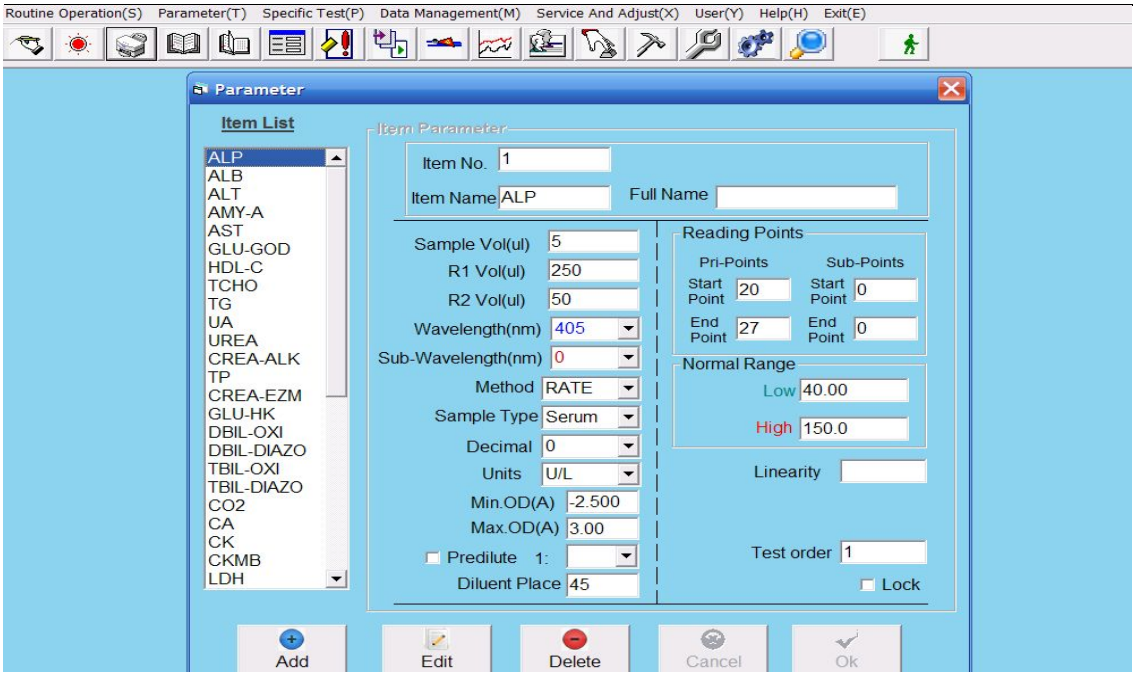
Figure 9 print reports diagram

6.1 Parameter Settings of the Tested Item

! ! ! !Note: In order to prevent the phenomenon of changing the item parameters casually, password is set. If you do not enter a password, you can only edit item parameters that are not closed in the parameter setting bar. If you want to edit the closed item parameters, you must enter the correct password. The original password is "00000000". You can also modify the original password by entering the password changing field to change passwords. Please keep in mind the modified password.

When entering a new test item or replace reagents, you need to change test parameters. Parameter setting process is as follows:

Click the "Paremeter “menu of "Item parameters" in the main interface,input the password‘00000000’ and enter the
following:



Click the item name in the item column, such as "ALT", the background of the item turns blue.At this point, item number, item name, full name, the test item parameters and other information of the tested item are revealed.

Sample parameters: sample volume, the volume of the first reagent, the volume of the second reagent. These data will limit the volume of solution extracted by sample syringe, reagent syringe; input range of sample is between 2-50ul, the volume of the first reagent, 25 -300μl, the volume of the second reagent 10-150ul. If you do not set the second reagent, you can enter "0" or not input anything in the second reagent bar.

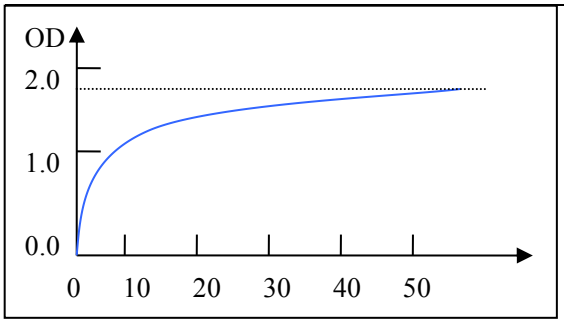
The test parameters are as follows:

Test the dominant wavelength: select among 340,405,450,510,546,578,630,700;

Test the Auxiliary wavelength: select among 0,340,405,450,510,546,578,630,700.

If you do not set dual wavelength, select blanK of the second wavelength;

Test method: the end-point method, the two-point method, dynamic method, turbidimetry, select according to the test reagents and methods; typical reaction curves are as follows.



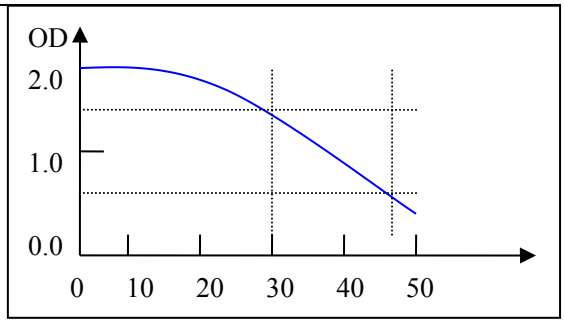


Figure 10. Endpoint method response curve diagram Figure 11 dynamic method reaction curve diagram

Slope: If the absorbance readings are becoming bigger, that is a positive slope.
If the absorbance readings are becoming smaller, that is a negative lope
Maximum slope: it represents the maximum allowable amount of absorbance change. If it is larger than the set value, indicating that there is error the sample which is being analyzed. Instrument gives failure code, suggesting that the specimen need to be retested
Reading point: the main reading segment is beginning time of reading and the period of reading time;
There are 40 points of the instrument in the whole process of reading, interval of each point is about 18 seconds, and the entire reading time is 40 × 18 = 720 seconds (12 minutes).
If you choose the third minutes as the starting point, the reading interval is three minutes. Then the starting value is 10, the end value is 20.

If you need to adopt the blank sample method during the test, you should read blank sample while reading. You should apply the method of Sec readings, meaning reading the blank sample data in the auxiliary reading section, read the response data in the main reading section, and process data according to the need. Auxiliary reading section is located before main reading section. Please set the data according to the need.

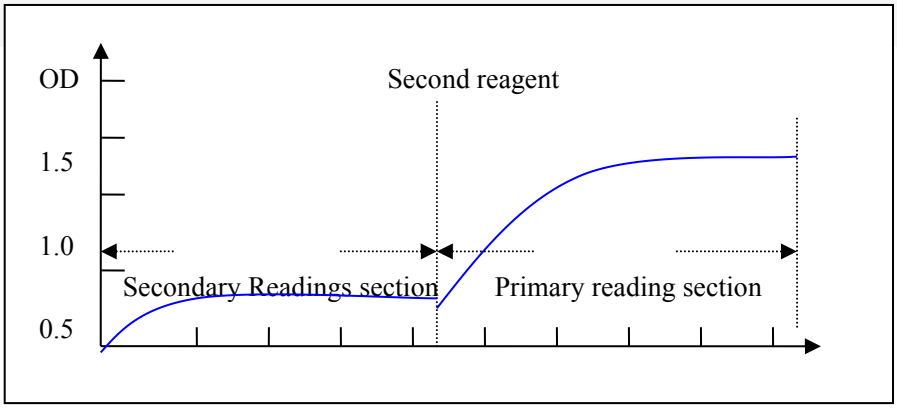


Figure 12. Auxiliary reading segment diagram

Normal range: it refers to the normal range of the test results, the instrument will prompt in the test results when surpassing this normal range.

Linear correlation: If the machine's test results are different from expectations, you can be modify the result according to the formula Y = AX + B, change the coefficient A and B to amend the test results.
Unit: Concentration units can be selected in the drop-down list.
Accuracy: the number of decimal places of the test results can be selected in the drop-down list.

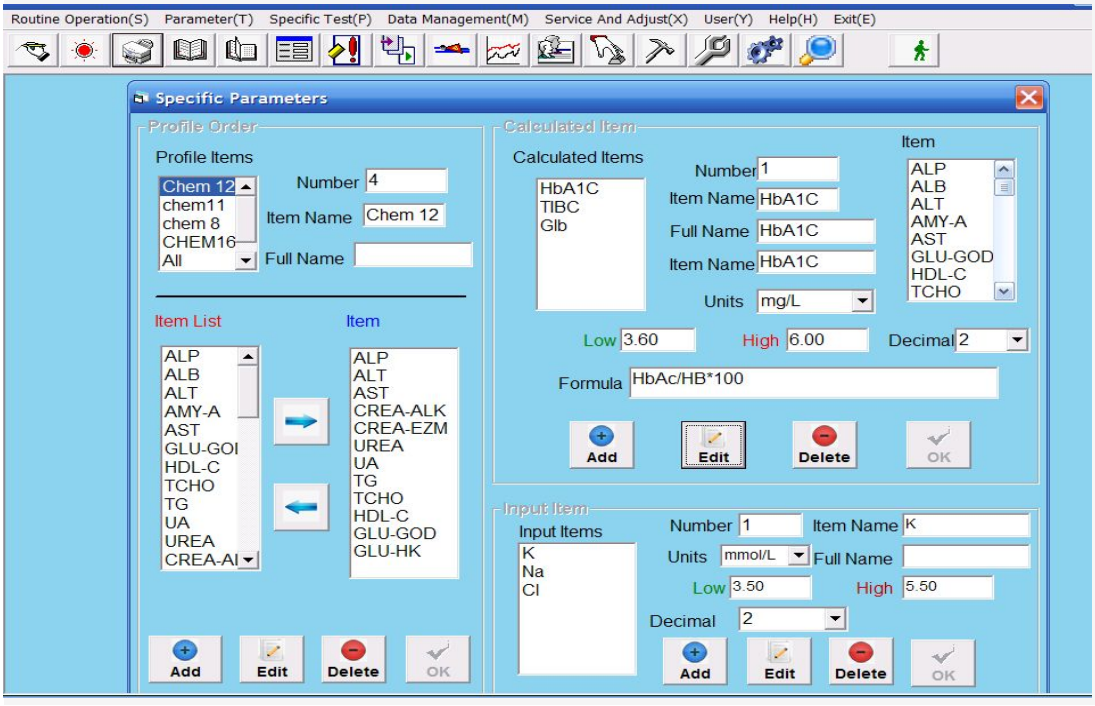
Maximum rate of change (A / min): It refers to the maximum absorbance change. In particular when controlling enzymatic measurement, due to the high concentration, reaction is violent, change of absorbance is rapid so substrate is depleted and false results, if this happens, the instrument will prompt re-test the specimen.

If you want to modify the item parameters, select the item in the list of items column, click "Edit" button, and then the cursor can be moved to necessary parts to modify, if one wants to cancel the change; click "Cancel" button. If you want to save your changes, then click the "Save" button.

If you want to delete test item parameters, select the item in the list of items column, click the "delete" button, and then remove the item parameters.
If you want to add the test item, click the "Add" button to enter the test parameters, and save the input.

6. 2 **Parameter Settings of Special Items**

Click the "special item parameter settings" menu of the" Item setting "in the main interface to the following
interface:



6.3 Parameter Settings of profile item

Click the "Add" button in the column of items portfolio parameter settings, enter the number, the short name, full Chinese name, full English name of the item, and the short name of the item must be entered.,: click the item in the optional items and the background color of the item turns blue, click the "=>" button to add items to the list of selected items and use the same method to select other items. If you want to delete the selected item in the list, first click the item, then click the "<=" button, the item disappears from the list of selected items. After all of the items are selected, click "OK" button, the setting of items portfolio is completed;

you can edit the items portfolio with the help of "Delete" button and "Edit" button.

6.4 Parameter Settings of Items for Calculated item

Please click the "Add" button in the column of Parameter Settings of Items for Calculation. Please enter the number, short name, Chinese full name, English full name of the item, and the short name of the item must be entered, and enter the normal low value, normal high value, number of decimal places. If during specimen test, all the test items contained in the formula appear. After the test is completed, the value of items for calculation will be automatically calculated and results will be printed.

Please edit the formula, you can directly enter the item name (item must be in the list of selectable items), or select an item in the optional item column. There can be only the item name and calculation symbols in the formula. No other non-standard symbols are allowed. Please click "OK" button after setting the item.

You can edit the item for calculation with the help of button "Delete" and "Edit"

！！！After deleting items must delete this item in Print item order, otherwise you will make mistakes.

6.5 Parameter Settings of the Entered Item

Please click the "Add" button in the column of Parameter Settings of entered Items. Please enter the number, short name, Chinese full name, English full name of the item, and the short name of the item must be entered, and enter the normal low value, normal high value, number of decimal places. Please click "OK" button after setting the item

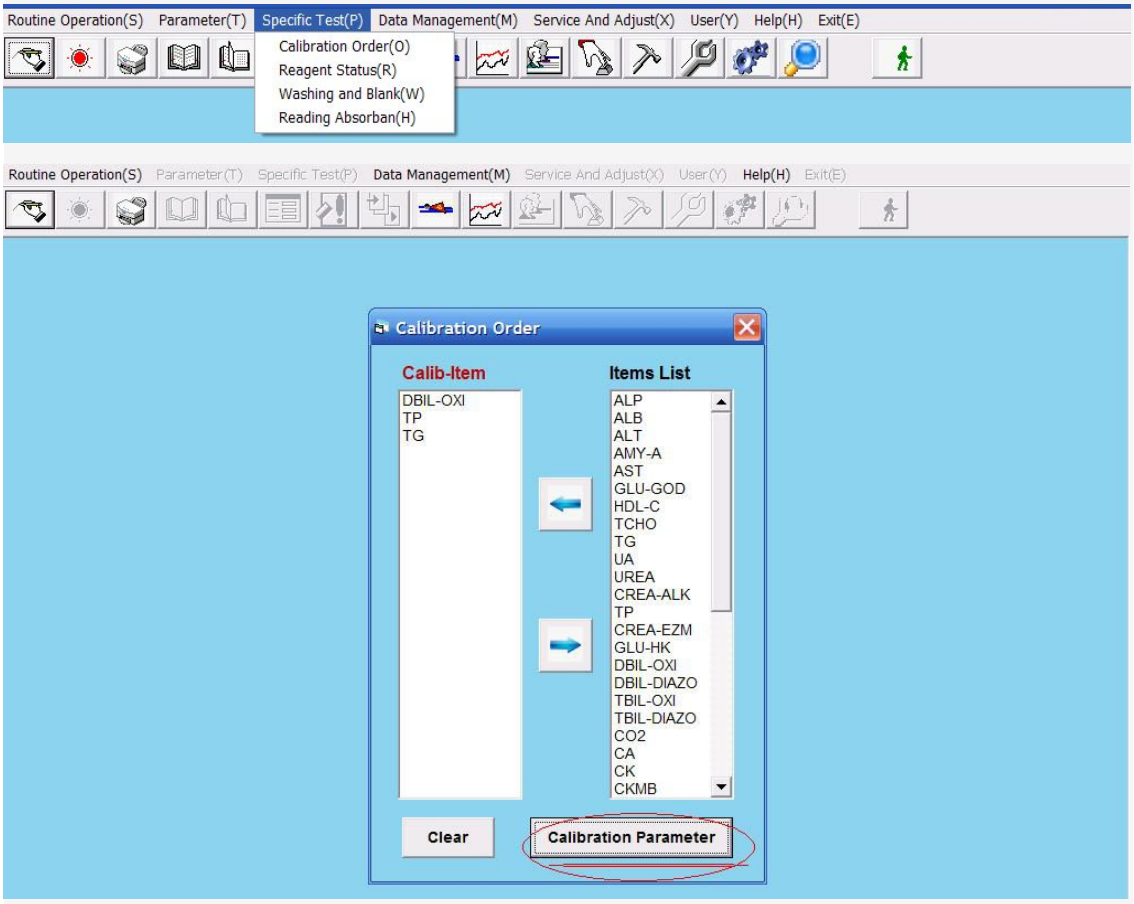
You can edit the item for calculation with the help of button "Delete" and "Edit"

Note: The entered item of the printed report must be maintained in this column. If there is no item in this column, the entered data can not be printed.

7 Specific test

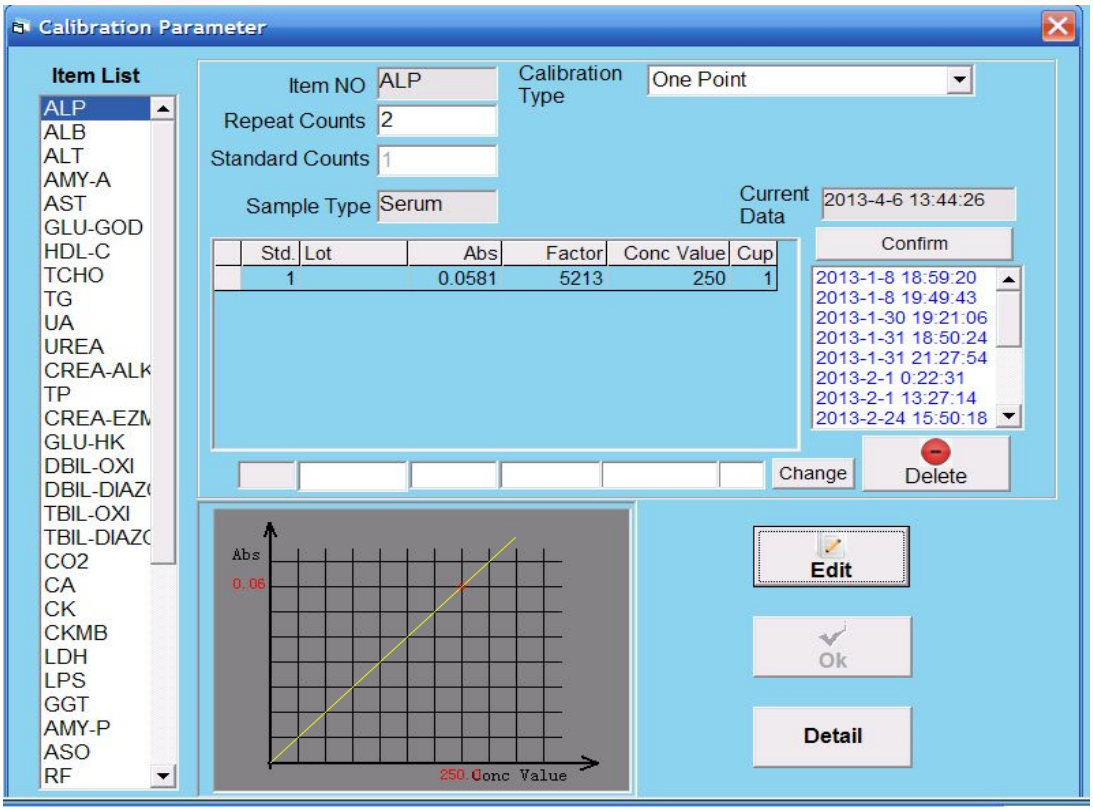
7.1 Calibration and QC

Some test items need calibration.click the " specific test " and choose ‘calibration order’ to display the following interface:



In detection mode , select the calibration mode.

Calibration item parameter need to be done before calibration procedure,click "calibration parameters" button to display the following interface.

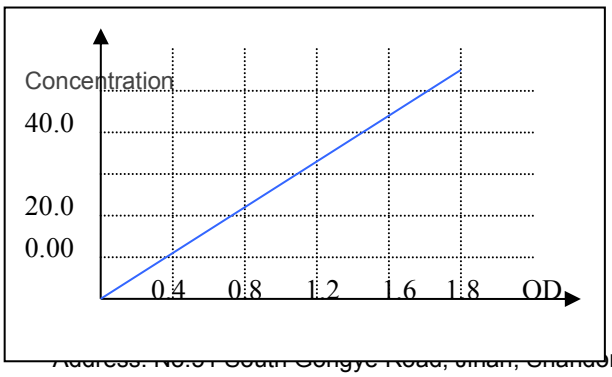


Click the item refering to the “item list” to list the item parameter in the screen

Item name and test parameters shows the same.The calibration mode can have a variety of options.

Calibration mode:Calibration mode for Sapphire
Single standard
Double standard
Multi-standard (passing the zero point)
Multi-standard（without passing the zero point）

Formula: the formula are as follows:
Y=AX
Y=AX+B
Y=A0X^n+A1X^(n-1)+……..+AnX
Y=A0X^n+A1X^(n-1)+……..+AnX+B



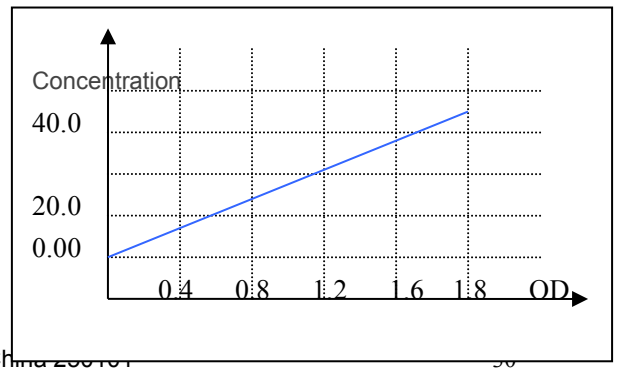


Figure13.Calibration curve of a single standard tandard

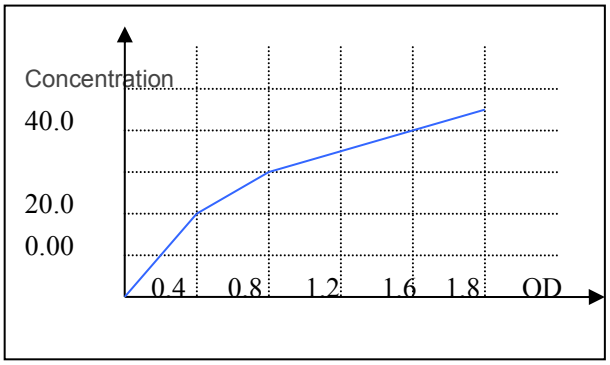
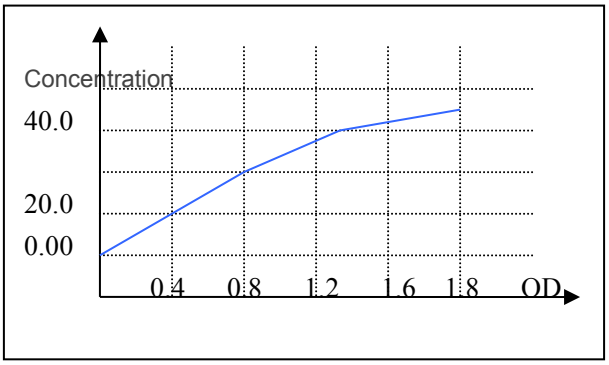


Figure14.Calibration curve of doubles



! ! ! Usually use a single standard is enough.

Repetitive times: Repeat the test several times, the result is the average one of the result

.Number of Standardized ones : place several Standardized ones at once,One item can have 6 standardized ones ,Multi-point calibration is allowed.

Specimen Type: Serum, urine, and so on.

Reagent blank absorbance (sample): reagents (samples) and blank absorbance value, this data is automatically measured in instrument calibration testing process (it needs not to be input).

Blank Category: reagent blank and sample blank value. If you choosee reagent blank,you can get the final absorbance test value by deducting in the test the he reagent blank of total absorbance.If you choose sample blank, firstly test sample blank in each sample test, and then test the reactant absorbance, the absorbance of the reactants minus sample blank absorbance will get the final absorbance data.

Standard number: multiple standards, each standard should has its unique number.

Standard batch number: input batch number of standard material.

Absorbance values: when calibration, the instrument measures absorbance values of standard material .

Calibration factors: the instrument calculate the coefficients according to the concentration of standard material, the absorbance value , reagent blank and calibration formula.

Concentration: input the concentration of standard material.Cup No.: when calibrating, standard material should be placed on the location of the sample circle.

The graphic box showd the calibration curve after calibration, the horizontal axis is the absorbance OD value and the vertical axis is the concentration value.

Change the scale of the abscissa scale, you can change the horizontal aspect ratio.
Change the scale of the ordinate scale can change the horizontal aspect ratio.The current calibration: select accredited calibration results in date list of all calibration and display it in the text box. If you want to delete a calibration data in the list, you can select the data, click “delete the calibration” button.

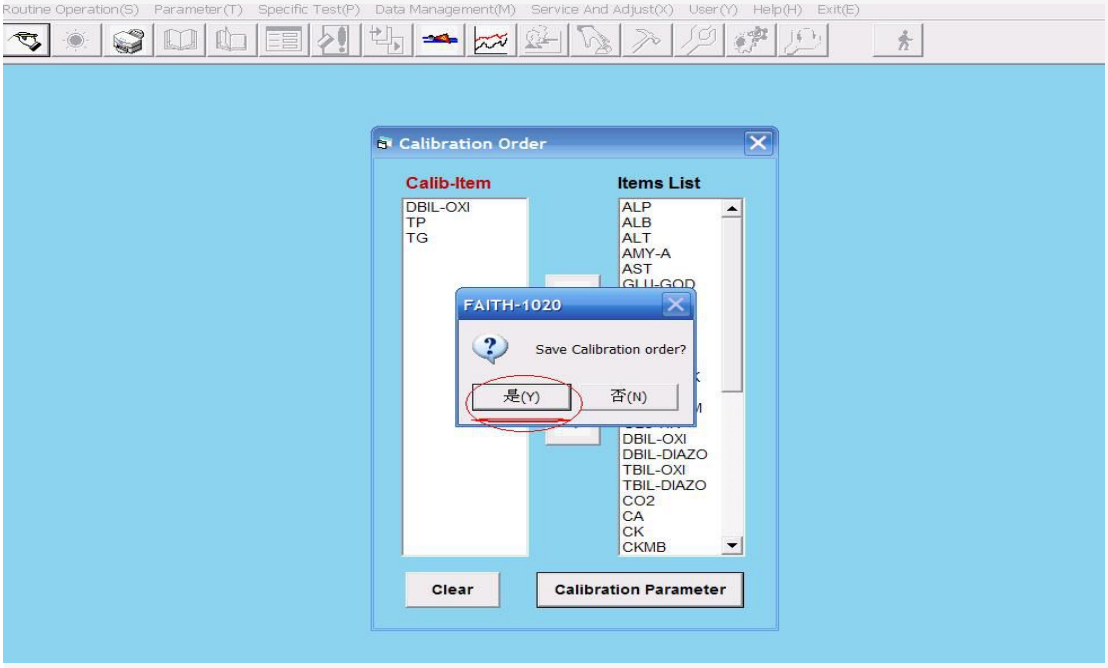
If you want to modify the calibration parameters, please press "Edit" button,.

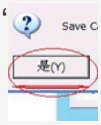
If the calibration results are right, you can click the "OK" button to save the calibration results.

Close the page, and returned to the “calibration order” interface.

Select the calibration item in the item list column, method of selection is the same as that described earlier.

If the data is entered correctly, close the page,then fileDialog as below:



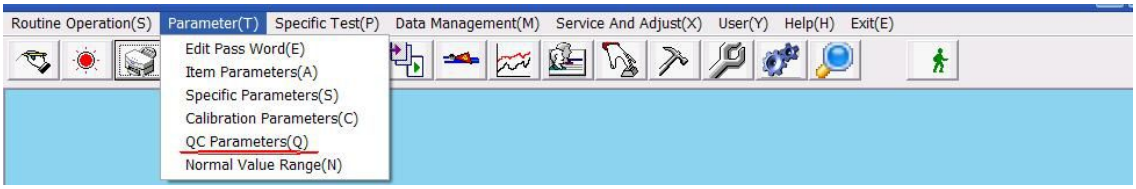
Click the ‘  OK’,and then open the ‘testing’or , then click ‘start’.The calibration test will start.
In the test process, you can click the "Stop" button,to stop the test.

After the test is completed, you can enter the “calibration parameters” to see results of the calibration.

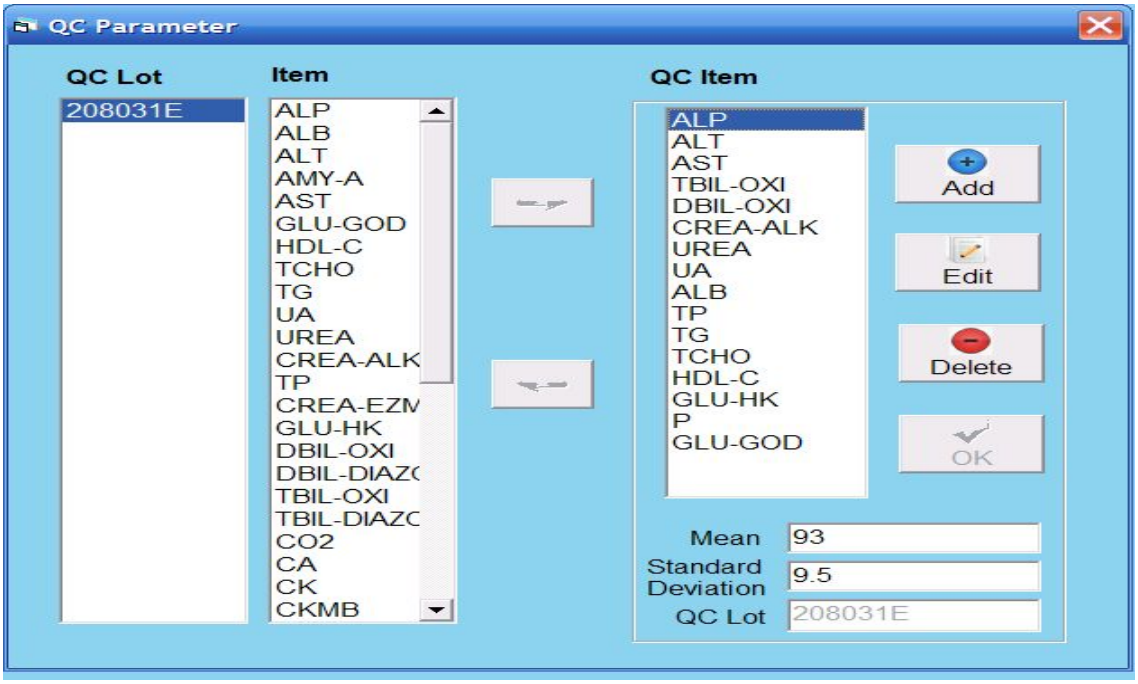
7.2 QC Test

In order to monitor the accuracy of test results, it is sometimes necessary to test quality control of some specimens. There are a variety of ways of doing QC test, the first method is in ordinary sample test, you can observe whether the test results is within the quality control range, the second method is to enter the “quality control test” interface to do quality control test.

Select the quality control mode in Test Mode;



Please firstly set the quality control parameters before doing quality control, click "QC Parameters" button to display the interface below;
Click the “add” button.



Click ‘add’,input the batch numberof QC(QC lot NO),Select test items in optional item column to add it to the "QC items" column, steps are the same as describe above;

In the "QC items" column, click an item and enter the average value standard deviation and range of the item, repeat the above steps, you can enter quality control data for each item;

Press the "Edit" button to edit the input values ;

Click the "OK" button to save the data;

In "Quality control" colunm, press "add" button to enter Registry Number placing number of quality control (indicating the quality control specimens were placed in the placing number of sample ring) and batch number of quality control. In “t items "column , select an item and add it to “QC items" column; Repeat the above steps and enter multiple quality control specimens.Use "Edit" and "delete" button to modify the input data; entry information can be shown in the QC entry list;

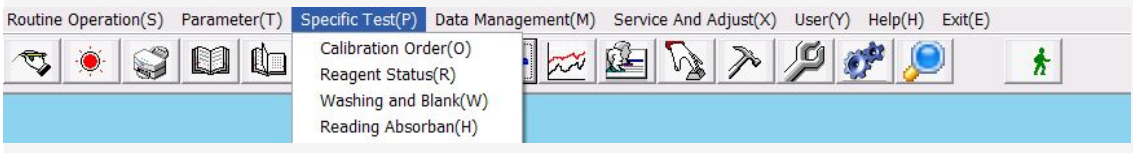
If the data is entered correctly, withdraw from the interface, and then open the ‘Sample order’ page,click ‘add’,choose the ‘QC’ and ‘Lot’,then choose the related test items,click ‘ok’,then open ‘testing’ page,start the test.

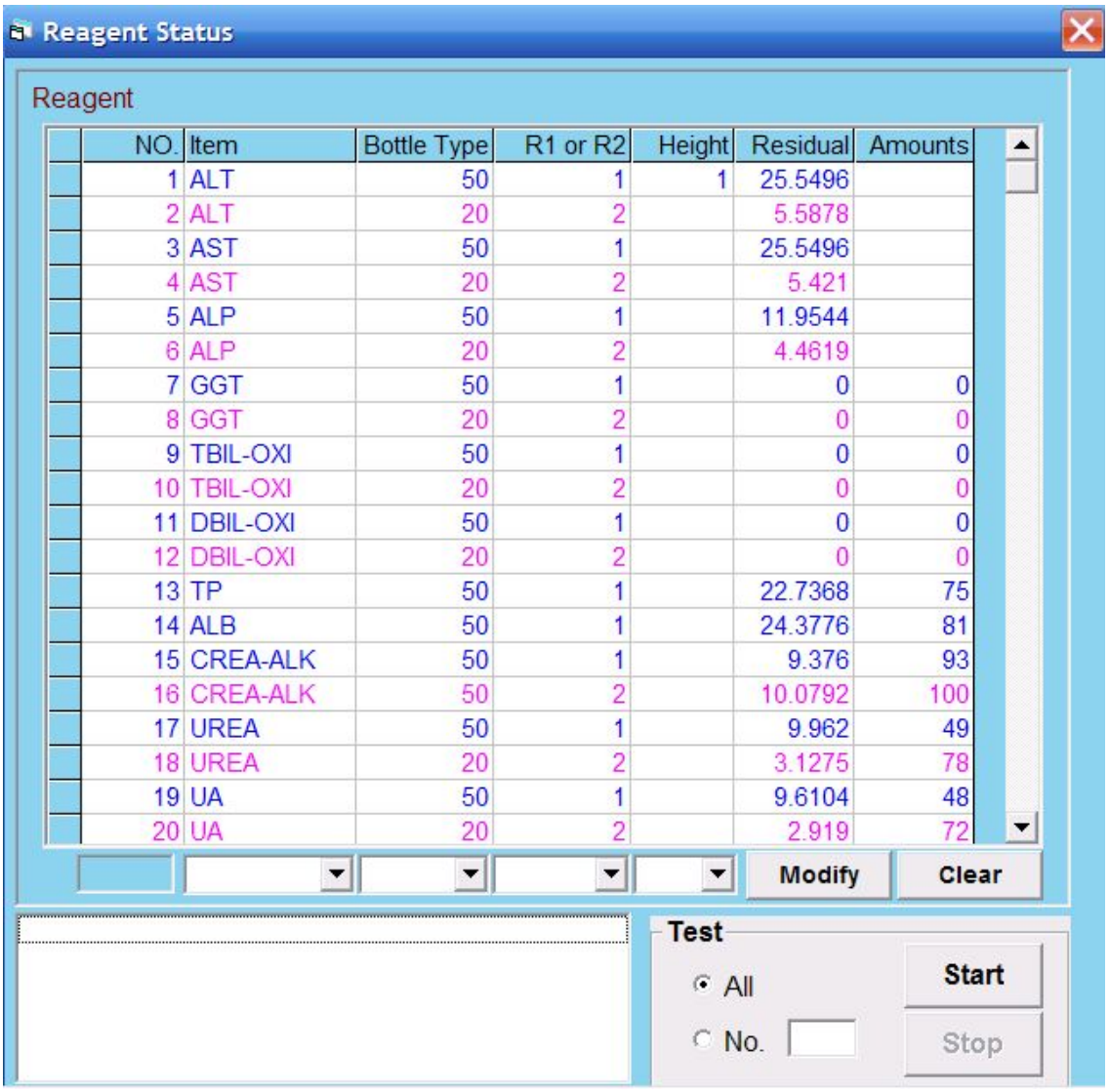
In the test process, you can click the "stop test" button to stop the test;
The test results are shown in real time in the results column, and the results are stored in the QC database.

7.4 Reagents

The instrument has a reagent disk in which 56 reagent boxes can be placed, order of reagents shall be set in the “reagent status” interface. The interface can estimate how many tests can the remaining reagents in the reagent boxes can do so as to avoid the situation that reagent is in shortage in the test process.

On the main interface, click the "reagent status" menu under the "specific test" menu to appear the following interface:





In this interface, you can enter the information of the reagent;

Position.: reagent box is placed on corresponding location of number in the reagent disk (range :No.1-No.56);

Items:are selected in the drop-down list of the input box;

Bottle type: maximum volumn of reagent box (ml);The height of the reagent box: net height of the reagent box (mm);

Reagent type: place of the first reagent or the second reagent R1 or R2;

Choose a position number,Click it.Then under the position list, input the information in blanks follow the Number position: Item name,Bottle type,reagent type

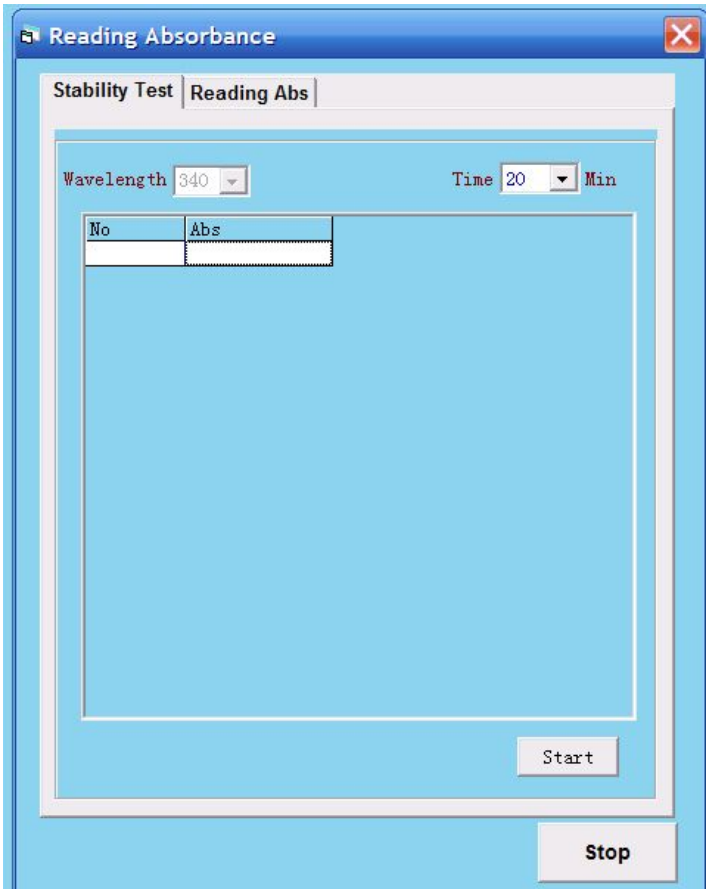
If you test the remaining reagent volume, click the "Test" button, the instrument automatically detects the reagent stock and calculate the number of items that can be tested.

! ! !NOTE: The reagents location can not be misplaced, before the test reagent, please make sure there is sufficient reagent for testing items.

7.5 Instrument Performace Test

For the needs of Instrument performance test and the calculation, we should test absorbance of some standard solution. Enter this program module, absorbance test and Instruments stability can be carried out.

In the main interface, click the "Reading absorbance" under “specific test" menu to enter the above interface.



Click “Stability test”:
Select the time interval for reading (Maximum one hour)
After the data is entered correctly, click the button "start" into test process.
After the start of the test, every 12 seconds to refresh the data, every five minutes to a records, until the set time interval. Observation data changes, and determine the stability of the instrument;

Click ‘Reading abs’:
Select the desired wavelength in wavelength drop-down list, after sample in cuvette is ready, click the button "start", and the instrument begins reading; After the reading is completed, the table shows the numbe of the cuvette and corresponding absorbance values , select the number of the cuvette to find the corresponding measured absorbance value.

！！！Note: In the process of the instrument performance tests must be at 120 cuvette deionized water was added as a water blank.

8. Data Processing

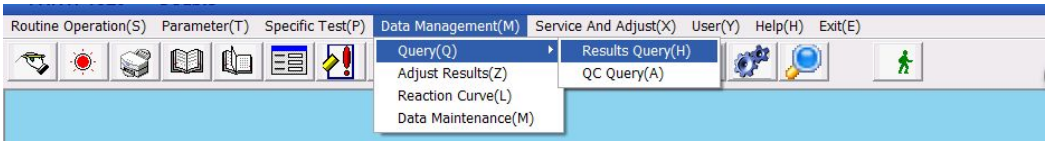
The ‘data processing’ consists of three sub-menu: test results query , response curves and data maintenance for data query processing.

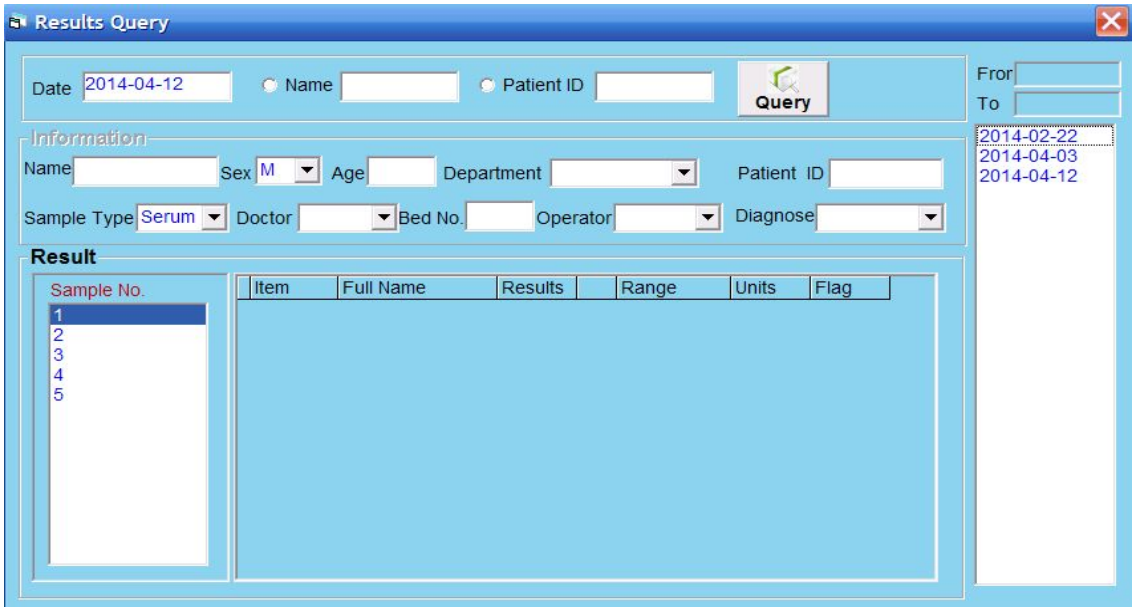
8.1 Search for Test Results

The query has two sub-menu: Query of quality control results and the test results

8.1.1 Query for Test Results

In the data processing interface, click the "Data management’ - Test Results Query menu, click the" Query” menu, then click ‘Results query’ ,the following interface appear:

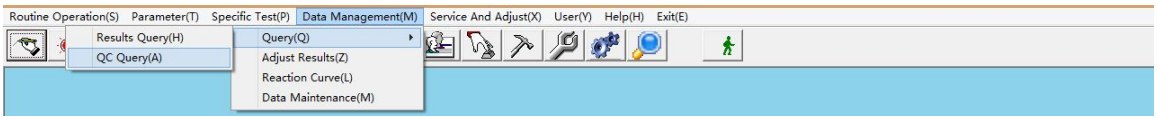


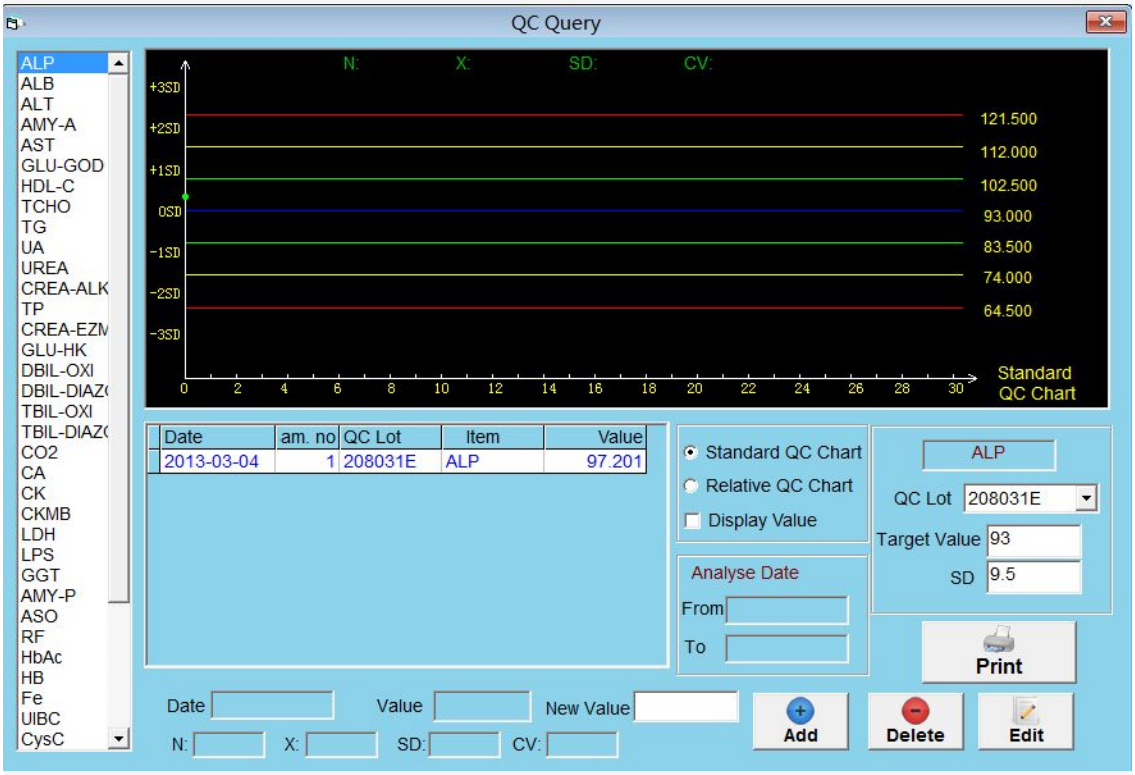


Queries can be carried out by a variety of ways, such as the date, name, patient number, registration number.there are three kinds of query: date , name and sample number. If according to the name, select the correct date, confirm the registration number of the day to display in the sample number column, select the appropriate number of samples, the results are displayed in the results column, click the button "Print", then print a report. Also can use a combination of query, enter a few queries, such as at the same time to enter the date and name.

8.1.2 Query for QC Results

In the data processing interface, click ‘data management ,click the “Query’, “QC Query” appears, appear the following interface.



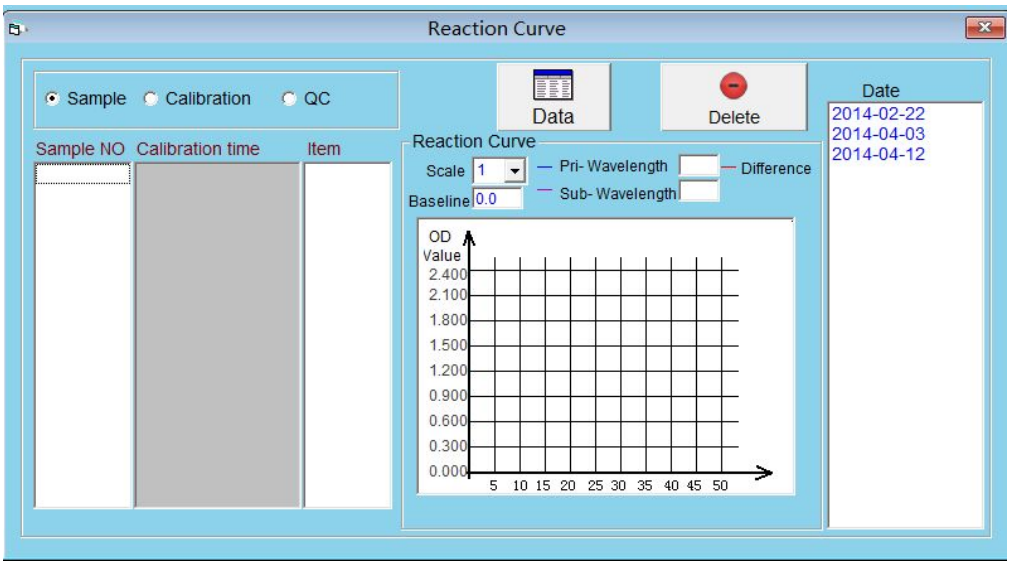


Select the test item in the Drop-down list, enter the start and end dates. Data, date and batch number of an item within a period of time is displayed in the QC value column. If several quality controls are made in the same day, we need to choose an appropriate data as a quality control chart parameters (the default value is the first data), the statistics column automatically calculates their average value, SD, CV. Quality control chart shows quality control graphics, click Print Quality Control Chart to print.

8.2 Reaction Curve Monitoring

During test, each test item, the instrument read a set of data on eight wavelength every circle for each test item. There are a total of 40 point value for each tested item, We can observe the reaction of the whole process to understand the correctness of the results.

Click the "reaction curve"of"data processing" menu to enter the following interface:



Click the "Delete" button to delete all the data of selected date

! ! !Note: Be careful to use the deleted data, data can not be recovered.

Click “Date” button, select the date.

Select the types of specimens that you want to query in samples, calibration and quality control.

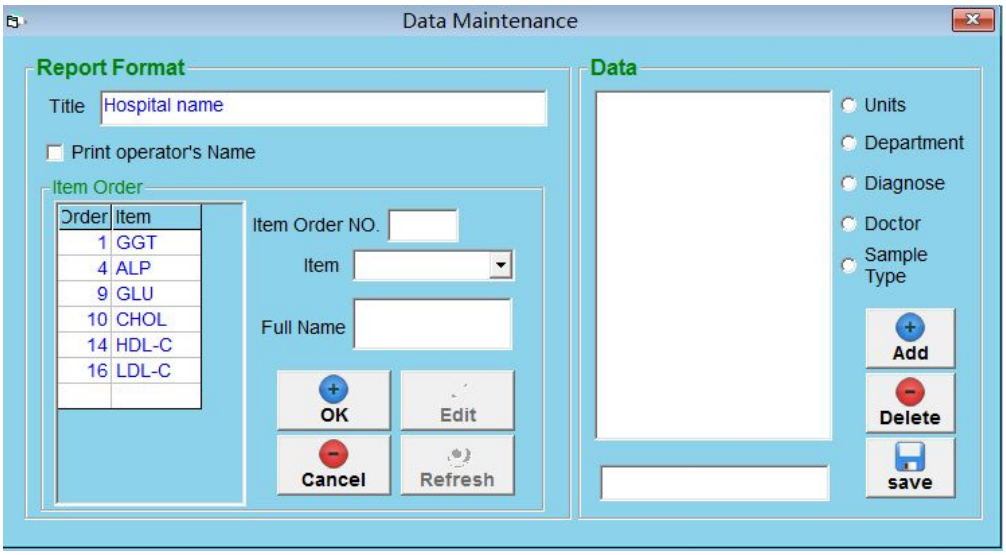
If you choose specimens, selected samples to display the number of samples in the sample column within that day, select the correct number of samples, the samples tested in the project displays the list of items;

If you want to observe the test data, click the "Data" button; the interface displays all the absorbance value of main wavelength auxiliary wavelength and the difference between the two, click the "data" button to exit,. Repeat the above process, you can query, calibration and quality control; click upper right corner "x" to exit the response curve monitoring interface.

8.3 Data Maintenance

Data maintenance is a module to effectively maintain the printing report and its datas.

click "Data maintenance" of “Data Maintenance” menu to enter the following interface:



In the Print Settings column, you can enter the name of the hospital which produced the report, place print order. In the data set column, you can input examining physician, units of measurement, inspection departments, clinical impression, inspection departments and other contents.

! ! !Note:
1.When arrange the item print order, it should be arranged all the items(contain computational item and manual item), otherwise the item data will not be to print.

2. The project has been deleted in “item parameters setting”, It should be deleted here, otherwise it will go wrong! !

9.Maintenance

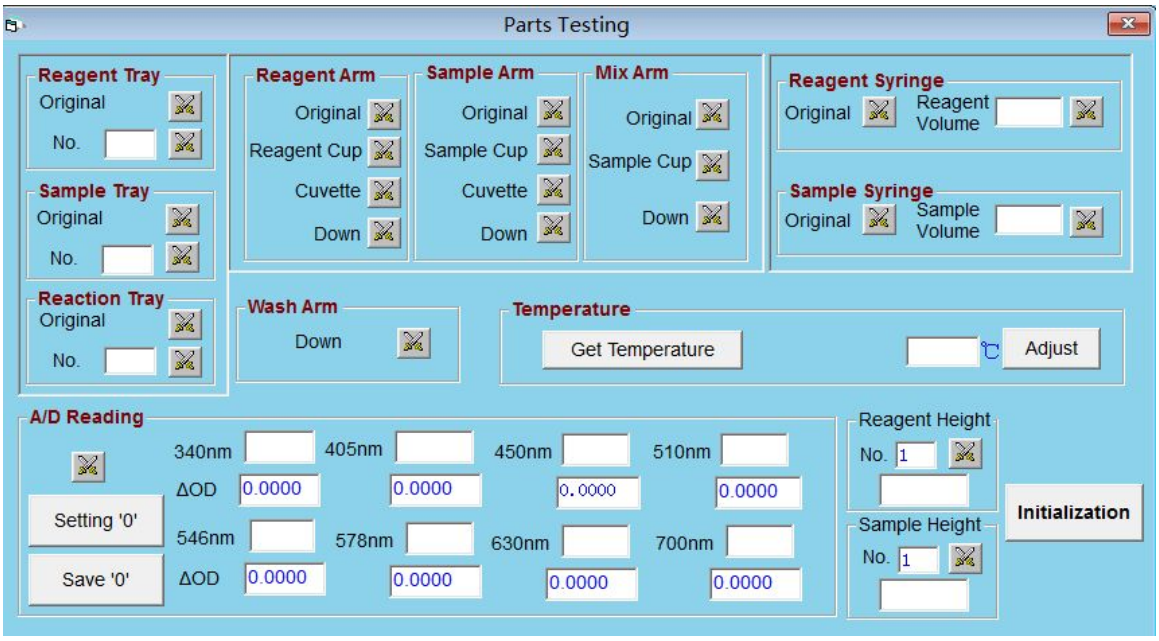
9.1 Instrument Initialization

Click "Initialization" of “Service and adjust” menu, the instrument reset can be reset.

9.2 Instrument Check

If instrument failure appears, you can use the instrument software to test the

various components in order to find the cause of the malfunction; click “Parts Testing “, the software interface is as follows:



9.2.1 Syringe Test

There are reagent syringe and sample syringe. There is a text box after each syringe, enter the syringe capacity and click the Execute button in the text box, syringe will move to the shape of desired capacity, click the "orginal "button syringe moves upward to the original location; If syringe does not move or not move to the disired shape, there is a fault of the syringe .

9.2.2 Sample and Reagent Arm Test

Mechanical movement test of sample arm is done by “ ” button. It can move to the level zero, reagent place, sample place, the reaction cup place.We can detect the vertical position of the sample arm. (the test of cleaning arm and mixing arm is the same of that of sample arm).

9.2.3 Turntable Test

The instrument panel has three dial: sample dial, reagent dial and reaction dial, there is a text box in the back of each dial label, if you input the number, click the Execute button, the corresponding dial will move to the desired location, click the zero button, dial reset.

9.2.4 A\D Reading

Click the the A / D reading, each wavelength signal readings will be displayed in their respective text box, if the signal value is not normal, indicating that the data channel has fault.

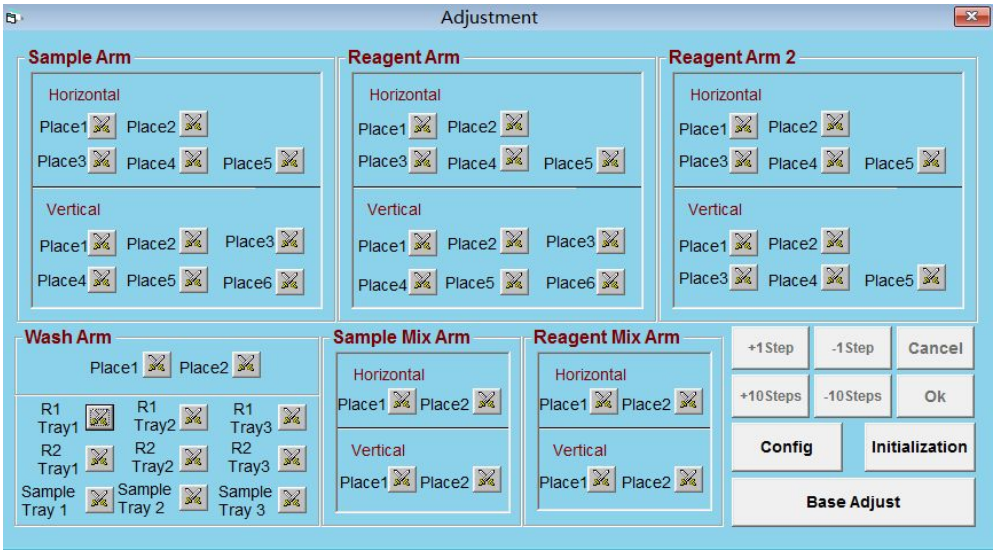
Click “ ” ,the wavelength related range is 20000~50000 and OD is close to

0.0015 .

9.3 Calibrating the Instrument

! ! !Note: The instrument calibration procedures must be carried out by professionals. To avoid damage is done to the machine non-professionals, we set the password: 666666.

It's mainly to adjust the position of the sample arm needle, reagents needle, stirring rod, cleaning needle and dial.
Click "Adjustment" menu of "Service and adjust " menu, enter the password to enter the interface as follows.



9.3.1 Horizontal Adjustment of Sample Arm

This adjustment corresponds to "the reagent arm >> horizontal adjustment". Click related " " ,Through adjusting reagent position, the reaction position and sample position, we can adjust the horizontal position of the sample arm, the reagent position and the position of cuvette. We can adjust the horizontal position of the sample arm through "+ Step" and "- Step" button, save the changes through the "OK" button, "Cancel" button to abandon changes.

9.3.2 Vertical Adjustment of Sample Arm

Adjusting the maximum depth of the pipetting needle vertically. This adjustment corresponds "the reagent arm >>the vertical adjustment" .Click related " " ,Through adjusting cleaning position, reagent position, the reaction cup position and sample position, adjusting with the help of "Add a step" and ""Reduce a step" button to make pipetting needle reach the maximum depth. If the pipetting needle can not touch reagents or samples in this depth, the instrument can not test the specimen. "OK" button to save the adjustment, and "Cancel" button to abandon the adjustment.

Pipetting needle is better to be adjusted to the bottom position of the sample cup.

!!! Note: SampLe cup and test tube could select one only during adjustment.

Stirring pin,reagent arm and cleaning needle adjustment is similar to that of sample arm.

9.3.3 Adjustment of Sample Tray and Reagent Tray

Horizontal position of sample Tray , reagent dial should be in the middle position of the pipetting needle, if there is any variant, just modify the data then could adjust the position, until adjust to the middle position.

9.4 Instrument Maintenance

9.4.1 Daily Maintenance

1, clean bucket, empty waste water bucket;
2, check the position of pipetting needle and the position of and whether there is blockage in the head of reagent needle and samples needle;
3, check whether there is blockage in cleaning mouth.

9.4.2 Weekly Maintenance

1. Use cleaning fluid to clean the pipetting needle, reagent needle and stirring needle;
2. Clean the surface of the instrument;
3. Clean positions holding reagent.

9.4.3 Maintenance for Every 6 Months

1, check whether the light source lamp is normal, replace it if necessary;
2, check whether the injection pump is working properly;
3, check whether the syringe leaks and replace it if necessary with a new syringe.

9.4.4 Annual Maintenace

1. Check whether the power supply voltage and the ground wire is in good contact.
2. Maintenance robotics arm.
3. Water pipe replacement.

4. Adjustment of the instrument position.

9.5 Spare Parts Replacement

9.5.1 Light Source Lamp Replacement

It is generally required to replace the light source lamp within six months or after 1500 hours of work time.
1. Open the rear cover.
2. Remove the light cover.
3. Remove the old light source lamp and replace it with a new light source lamp (12V 20W) .Note that the connector must be firm.
4. Set the light cover.
5. Set the rear cover.

! ! ! Note: in order to do this, power must be disconnected to avoid electrical shock; and you have to wait until the old light source lamp cools completely before replacing it with a new one so as to avoid burns.

9.5.2 Syringe Replacement

Syringe may be leaking after working for a period of time (six months or so), then it must be replaced.

1. Remove the rear cover.
2. Replace the syringe piston which is leaking, and note that screws should be set firmly.
3. Set the rear cover.

9.5.3 Reagent/Sample needle Replacement

If damaging a needle accidentally, you must replace it with a new one (need

professionals do the replacement and adjustment work).

1.Carefully remove the top cover of the needle.

2.Remove the screws.

3.Change a new needle.

4.Fix the needle.

5.Adjust the position of the needle through using the procedures software of needle adjustment.

6.Cover the top cover.

! ! !Note that the postion of the needle must be aligned, otherwise it will damage the new needle.

10. Malfunction Analysis

10.1 No Respond after Startup.

Check the power plug and the instrument fuse.

! ! !Note: Please use the fuse with a specification of φ5 × 20. Please replace the fuse according to the specification markd on the instrument.

10.2 Light Source Can not be Lit

Check whether the light source lamp is burned-out, and the light source lamp is of 12V/ 20W.Replace it if it is broken.

10.3 Reagent/Sample needle not Washed

Check whether the water pump is working. If the pump is normal , please check the waterway connecting pipe. If it comes off, please connect the pipeline.And then, if the pipe gets clogged, replace the pipe.If the water pump can not work correctly, replace it.

10.4 The Amount of Sample/Reagent is not Accurate

Check whether the syringes and the pipes leak,and whether head of the pipetting needle gtes clogged, and then replace them with new pipe or syringe.

10.5 Position of Sample/Reagent needle is Offset

Adjust the position of sample/reagent needle through the instrument adjustment software.

10.6 Result of One item is not Accurate

Check the reagent and adding situation.And observe whether other items are normal with the same wavelength.If not normal, replace the light filter.

! ! !Note: If the fault can not be ruled out, please contact maintenance engineers of the company. Contact information,please see the last page of the manual.

Suggestions:

Accuracy of test results from automatic biochemical analyzer is mainly decided by two factors.

First, reliable analytical instruments.Second, reagents of stable performance. Both are Indispensable.In the basis of ensuring high quality instrument performance, we suggest that users should buy product of trustworthy quality for the accuracy of your test results. Firstly,it is the reagent are approved by the state.Secondly,it is the products are verified by the majority of users.

11. Warranty Commitment

1.Warranty period lasts twelve months from the date of purchase.

2, During the warranty period, if the instrument is damaged, which is due to improper use or any accident,the Company will not assume any responsibility or obligations.

3, After the warranty period, the company is also

responsible for maintenance, but it will charge maintenance fee. Please provide maintenance organizations or maintenance personnels trained and approved by the company with drawings of the instrument and part of the necessary technical data.

4, Please contact the service department of the company to purchase the spare parts. Not the Spare parts of our company are likely to cause damage to the instrument and affect the use of the instrument.

Note: Cuvette, sample cup, reagent bottle, halogen lamp, syringe, sample/reagent needle, fuse are all consumables and not included in the warranty.

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